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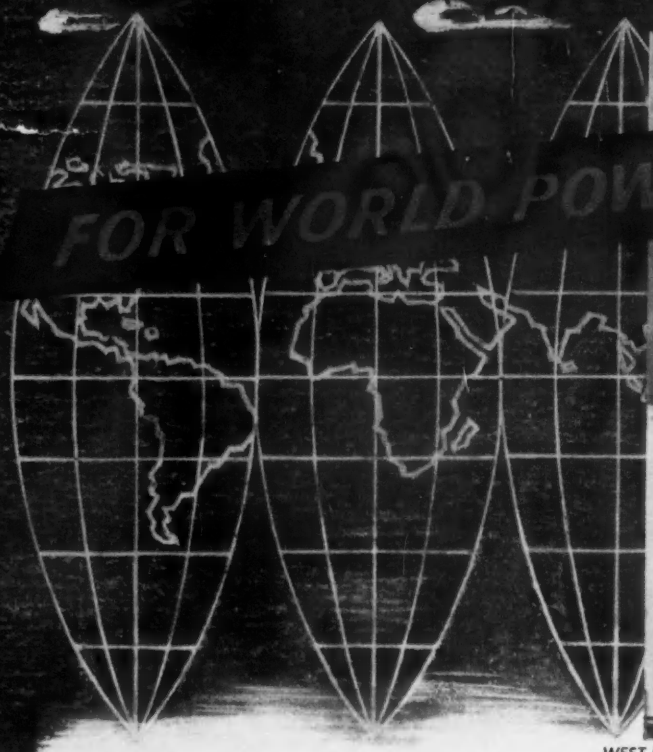
ELECTRICAL TIMES

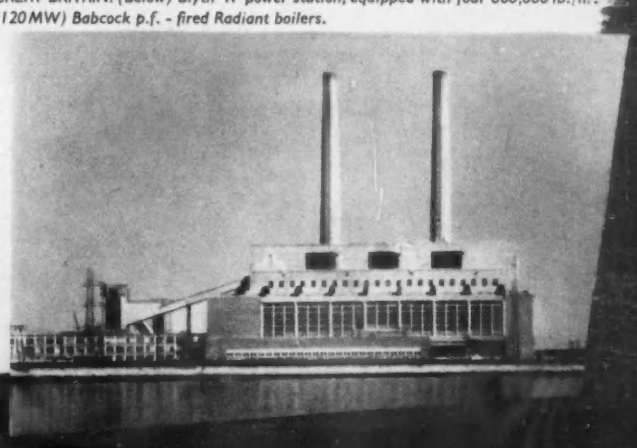
FOR WORLD POWER-GENERATION



WEST INDIES. (Above) Babcock oil-fired, Type FP, Integral Furnace boiler plant at Barbados Light and Power Co. Ltd. power station.

GREAT BRITAIN. (Below) Blyth 'A' power station, equipped with four 860,000 lb./hr. (120 MW) Babcock p.f. - fired Radiant boilers.

STEAM is, by far, the world's most important medium for electrical-power generation and a very high proportion of the world's power stations is equipped with BABCOCK steam-raising plant. Recent contracts for home and overseas central station boilers include units of 200, 300, and 550 MW capacity, a number to operate on a reheat cycle, and a 375 MW boiler of the "once-through" type to generate steam at supercritical pressure — 3650 lb./sq.in. and 1110°F, with reheat to 1055°F.



BABCOCK STEAM-RAISING PLANT

BABCOCK & WILCOX LIMITED, BABCOCK HOUSE, 209 EUSTON ROAD, LONDON N.W.1

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Rewinding and complete rebuilding for all electrical machines, up to the largest and heaviest industrial generators and electrical equipment, is provided by full, 24-hour working capacity, seven days a week, at the new ARCO Service Depot. With the most advanced and efficient methods, and a final high-voltage test to guarantee perfection, ARCO Rewinds give you the fastest emergency service in Great Britain today for all electrical repairs to both A.C. and D.C. machines.

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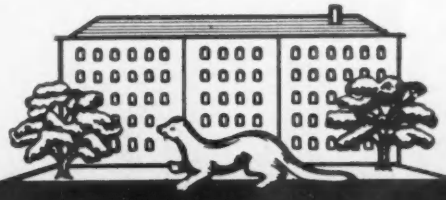
WHAT DO THESE FAMOUS NAMES HAVE IN COMMON?



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lamps and fittings can be obtained from any of fourteen branches and depots throughout the country.

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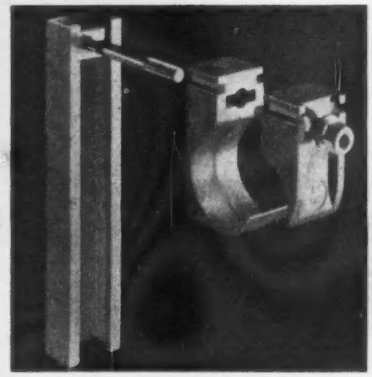
KEMPSTON WORKS **BEDFORD**

Service to the Community, Canadian Air Ambulance *(Photo National Film Board)*

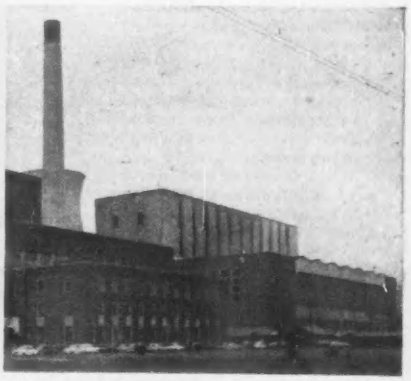
LEEDS POWER STATION USES CS CABLE SUPPORTS

This immaculate cable run is part of the Central Electricity Generating Board's new installation at Skelton Grange 'B' Power Station, Leeds. It employs the new C.S system of cable supports which is gaining rapid favour everywhere. This system was chosen not only for its excellent appearance but also for the following outstanding advantages:

* The unique hook section eliminates manual holding of cable during fixing.
* A universal channel section simplifies adaptation vertically and horizontally.
* All components are in aluminium alloy to B.S. 1490 and 1476 for maximum corrosion resistance.
* Careful design combines good appearance with economy.
* The cost is less, both initially and in installation.
* Sizes cater for cables ½" to 3" diameter.



An exploded view of the C.S. system showing the principal components. The backnut at the channel end is self-locking.



C.E.G.B.'s Skelton Grange 'B' Power Station, Leeds. Consulting Engineers: Merz and McLellan. Contracting Engineers for Cabling Installation N. G. Bailey & Co. Ltd.

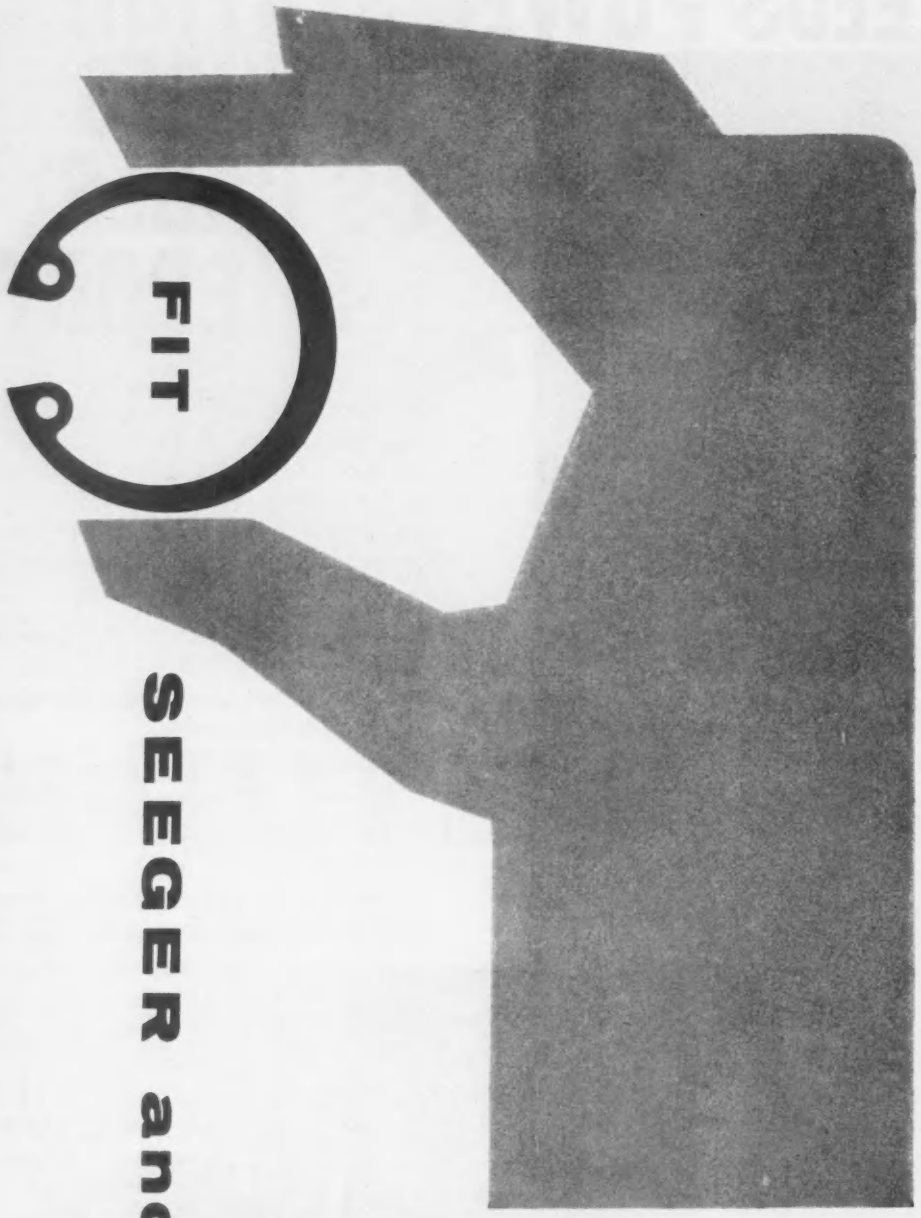
CS CABLE SUPPORT OUTDATES OTHER SYSTEMS

For detailed information and prices contact

CABLE SUPPORTS LIMITED

301 BRIXTON ROAD · LONDON · S.W.9

Telephone: Brixton 1103/5696



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Miniature, Switchboard and Portable Instruments. Moving Coil, Moving Iron and Rectifier Types. Micro-Ammeters, Milliammeters, Ammeters, Voltmeters, Frequency Meters and Phase Sequence Indicators. Educational Instruments.

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Transductors for the measurement of Heavy Direct Currents up to 20,000 amperes. Gas and Oil operated relays for Transformer Protection (Buchholz Principle). Oil operated relays for Tap Changer Protection.

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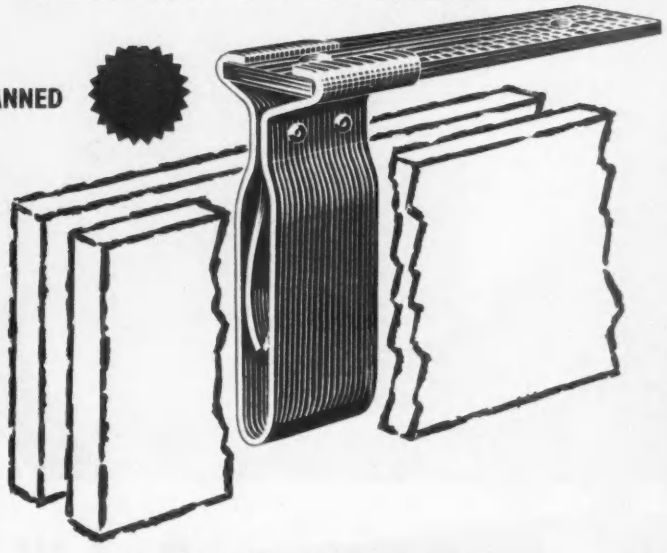

PLUG-IN CONTACT

The heart of a plug-in busbar system is the plug-in contact. The Barduct contact is designed to plug between the twin bars forming each phase conductor. Contact pressure is provided by heavy steel back-up springs which force the hot dip-tinned copper contact shell outwards. Ample resilience is provided to cope with normal production tolerances in components. The smoothly rounded tip of the contact ensures easy location during the process of fitting. Batch sampling of these contacts at twice their working load ensures reliability. Independent tests by N.P.L. have shown the P.D. at each contact to be not greater than 14 mV.

. . . BARDUCT IS *PLANNED* WITH PRECISION

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Barduct trunking is 5¼" wide and less than 2" deep and rated at either 150 amp or 250 amp per phase. Each conductor is enclosed and separated from the other throughout its length in high grade insulation, giving extreme reliability.

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designed and manufactured by

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Bed Warmer

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CRC 474

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Coil winding in the works of Radio Trade Supplies Ltd. Southall

The insulation on Lewmex wire is so flexible that a wire can be wound round a mandrel of its own diameter without the insulation cracking. This high degree of flexibility cannot be over-rated for it provides an added safety margin. Tests at 130° C ensure that the flexibility of the film will be retained under working conditions involving relatively high temperatures.
Lewmex wire has been in use for over fifteen years and is the finest of its kind. Leading manufacturers of electrical equipment have made Lewmex their choice for a wide variety of applications.

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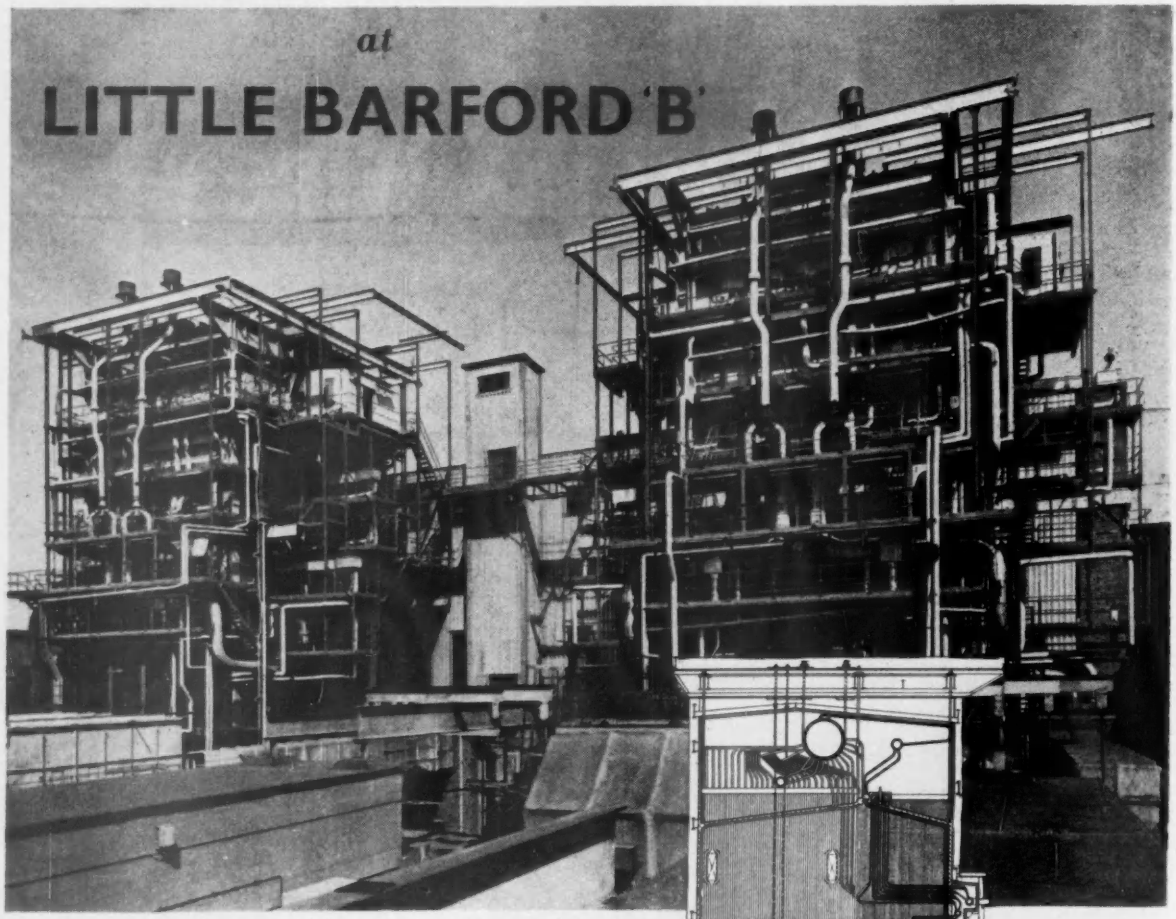
THE LONDON ELECTRIC WIRE COMPANY AND SMITHS LIMITED · LEYTON · LONDON E.10

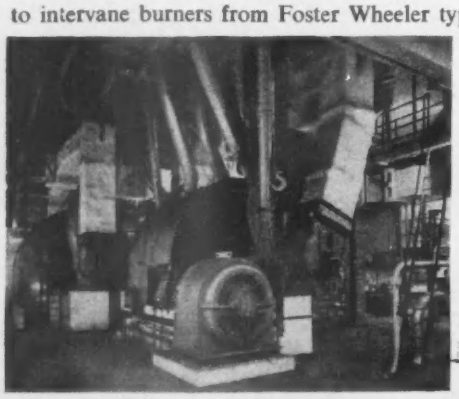
FOSTER WHEELER

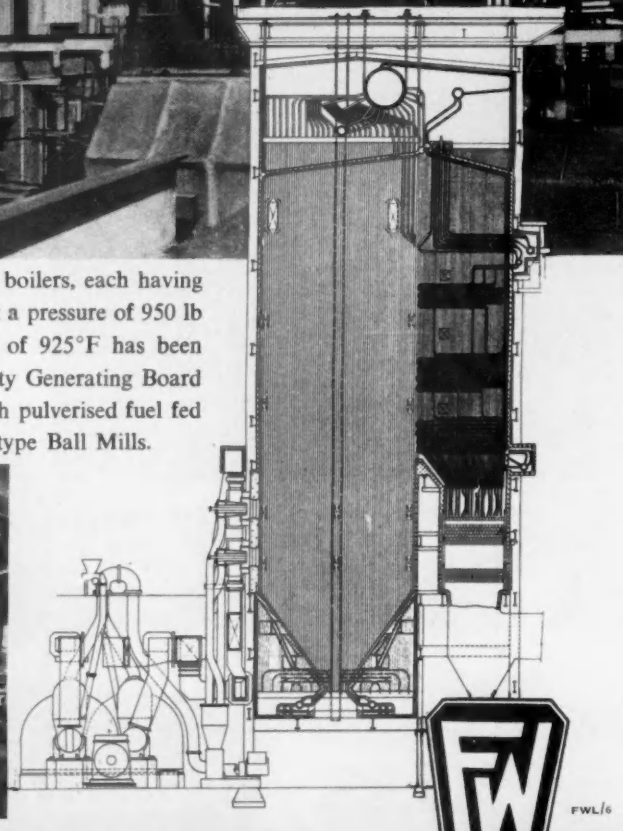
at

LITTLE BARFORD 'B'



This outdoor installation consisting of two boilers, each having a maximum evaporation of 550,000 lb/hr at a pressure of 950 lb per sq in with a final steam temperature of 925°F has been designed and built for the Central Electricity Generating Board by Foster Wheeler. Each boilers is fired with pulverised fuel fed to intervane burners from Foster Wheeler type Ball Mills.





FWL/6

FOSTER WHEELER LIMITED

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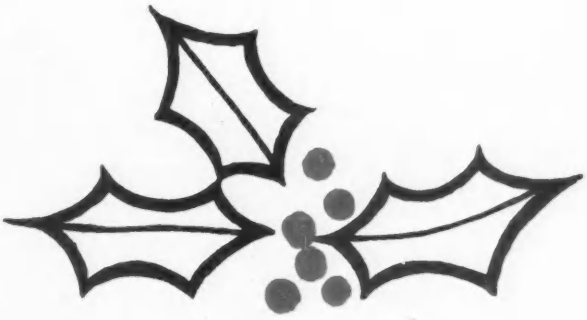


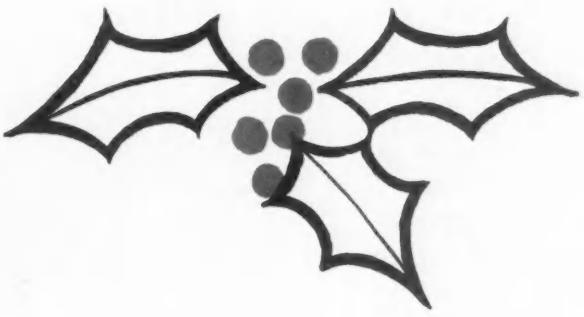
A Merry Christmas

to you all from

HOOVER

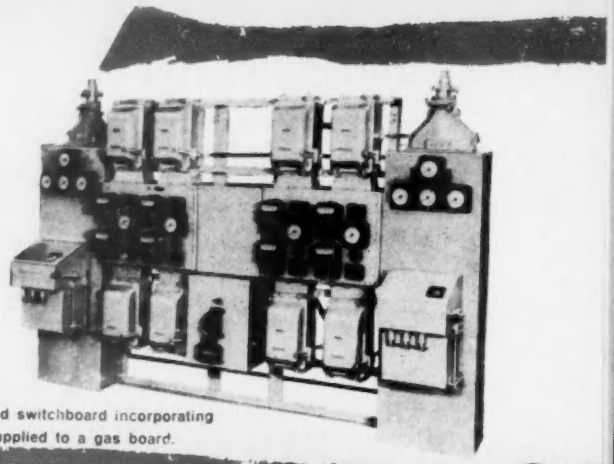
and best wishes for prosperity

in the New Year

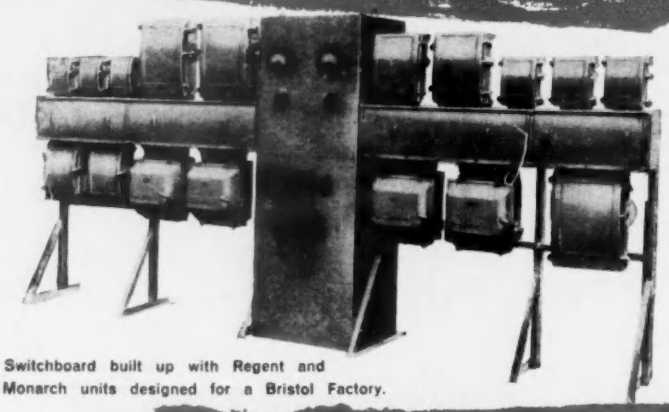


Simplex Switchboards

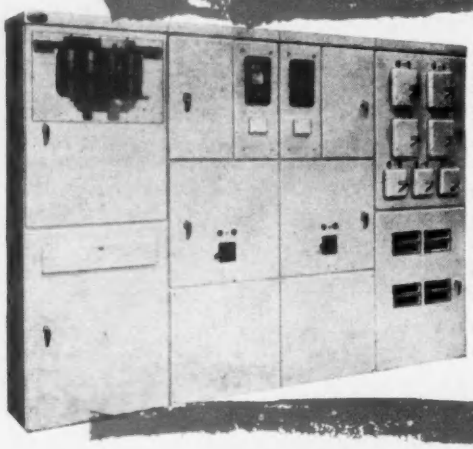
Simplex leadership stems from vast experience, sheer technical efficiency and a team of brilliant designers who are constantly setting new trends for the industry



Specially designed switchboard incorporating Monarch units supplied to a gas board.



Switchboard built up with Regent and Monarch units designed for a Bristol Factory.



Cream coloured cubicle type switchboard, incorporating mimic diagram of floor-warming circuits, made up of Star and S & S installation switches controlling all electrical services at a dock's reception area.

Multi-tier Regent switchboard with Monarch incoming unit for an international airport.

SIMPLEX ELECTRIC COMPANY LTD.
CREDA WORKS, BLYTHE BRIDGE
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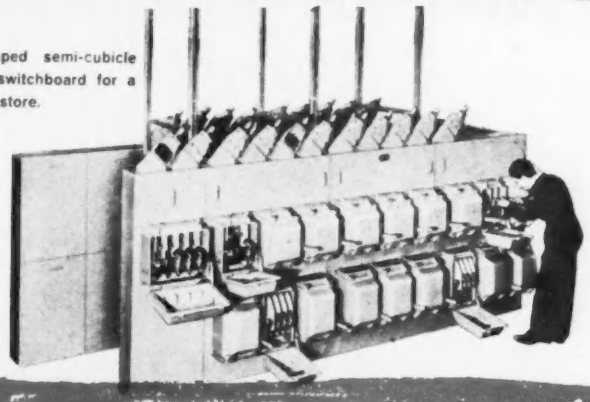
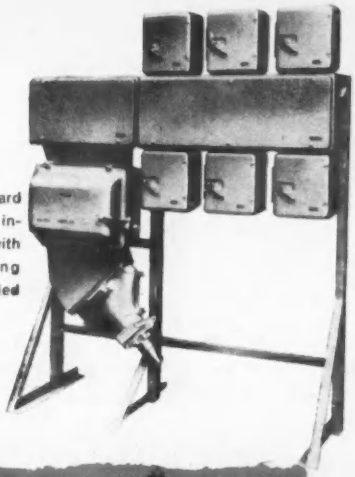
Branches throughout Britain and Agents throughout the World

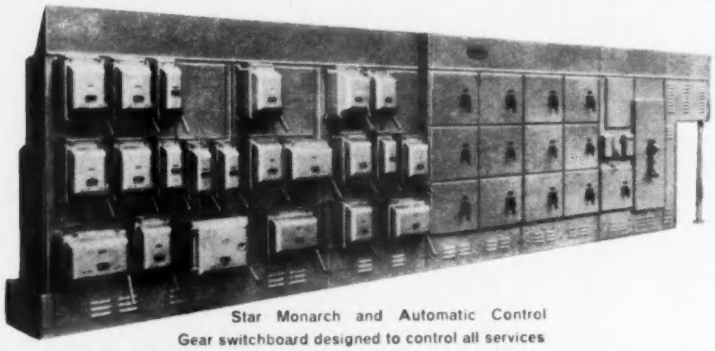
ELECTRICAL DIVISION (TI)



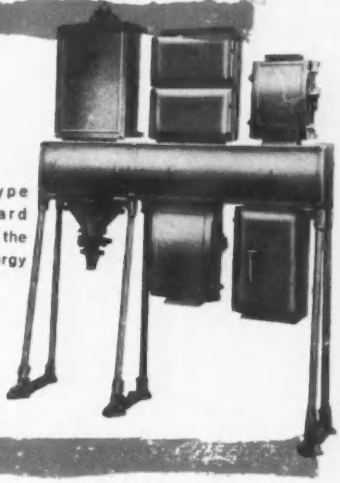
U-shaped semi-cubicle type switchboard for a large store.



Star switchboard with Monarch incoming unit (with angled sealing chamber) supplied to a factory.

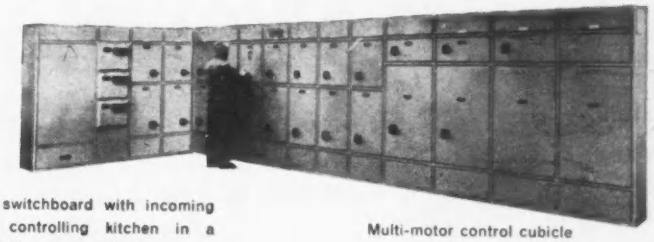


Star Monarch and Automatic Control Gear switchboard designed to control all services (and floorwarming) for a comprehensive school, Menai.



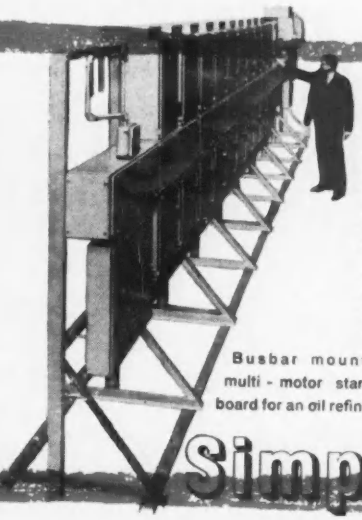
Regent type switchboard supplied to the Atomic Energy Authority.

Multi-tier Star switchboard with incoming Monarch unit controlling kitchen in a Commercial Building, Birmingham.

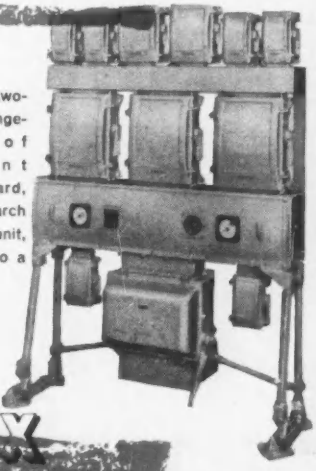


Multi-motor control cubicle for an oil storage installation, London.

Switchboard with Star and Monarch units for a secondary modern school.



Busbar mounted multi-motor starter-board for an oil refinery.

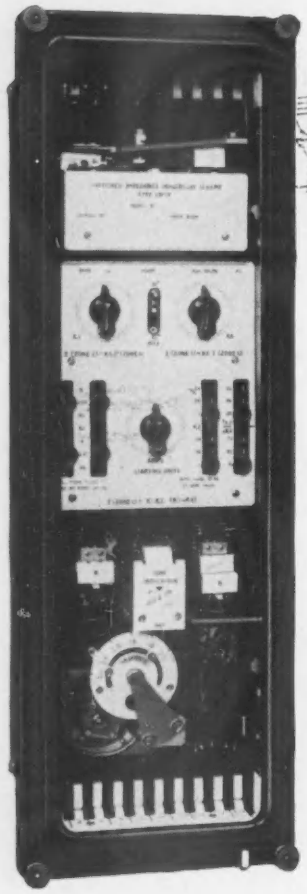


Typical two-tier arrangement of Regent switchboard, with Monarch incoming unit, supplied to a factory.

Simplex

Now! an economical DISTANCE PROTECTION SCHEME

for distribution lines



The new 'ENGLISH ELECTRIC' type SSM3V switched 'Mho' distance scheme provides phase fault protection for 11 kV or 33 kV lines at a cost very little more than inverse-time overcurrent relays. It overcomes discrimination problems and is high speed in operation.

Correct zone and phase flagging is always ensured by a simple interlock system which releases the flag mechanism only when the relay trips.

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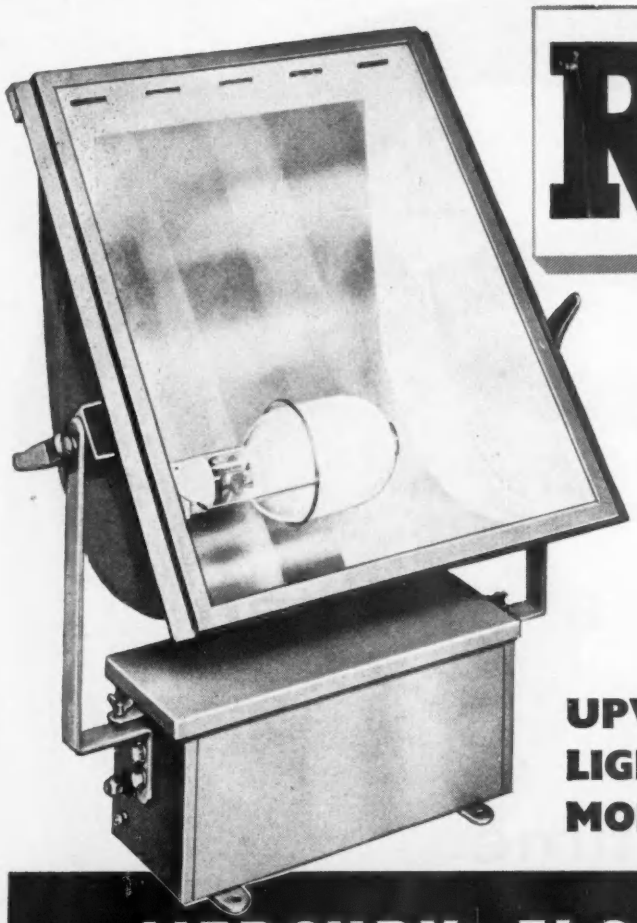

R E A L

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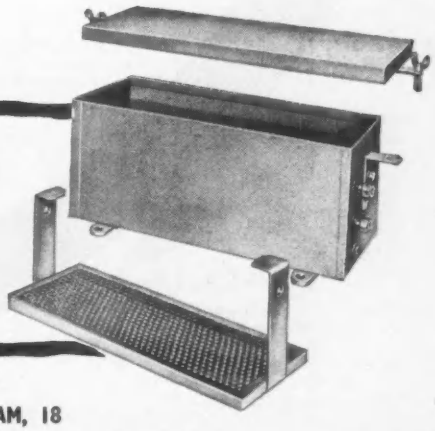
UPWARD LIGHTING MODEL

MERCURY FLOODLANTERN

for 250/400 watt MBF/U Lamps

List No. 1231. This Weatherproof Lantern incorporates a Parabolic asymmetric Reflector 3° focus, and is suitable for short or medium range floodlighting of vertical surfaces.

It is just one of the R.E.A.L. range of Floodlanterns comprising some fifty models and catering for practically every type and size of lamp.



'UNIVERSAL' CONTROL GEAR BOXES

List No. 1209. The perforated tray supplied with the R.E.A.L. Box greatly facilitates gear mounting.

Each Box fitted with packed glands for incoming and outgoing cables.

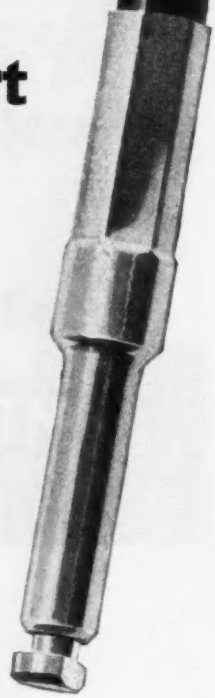
Have you yet received your copy of LIST P.6004?

ROWLANDS ELECTRICAL ACCESSORIES LIMITED, R.E.A.L. WORKS, BIRMINGHAM, 18

10%
cheaper at the start

100 times
stronger in the end

–it's aluminium cored!



Flex this aluminium-cored welding cable 2,000,000 times —it still will not break or fray at the termination ferrules, which grip both core and sheath. With a fatigue strength *more than a hundred times* that of the conventional type, yet very much lighter and appreciably cheaper, it is the ideal welding cable –developed by Alcan Industries, who provide the raw material and can recommend suppliers.

Alcan Industries have long experience in meeting the needs of the electrical industry for aluminium rod, busbar, castings, transmission fittings and other materials. If you have a problem that aluminium might solve, we shall be glad to hear from you.

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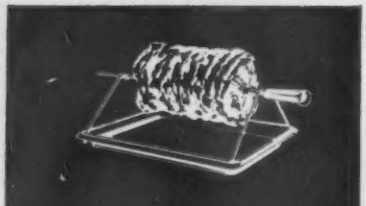
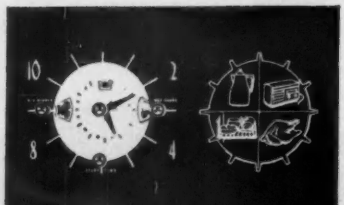
Tomorrow's cooker is today's

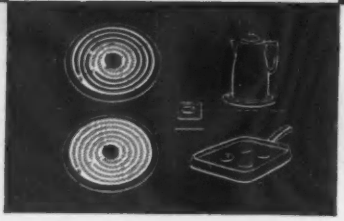


ROTISS-O-MAT SPIT
Newest, most effective way to roast—on a spit, for far better results in far less time. Self-basting to seal in flavour and juices and thereby *end meat shrinkage*. Uses regular oven thermostat settings. May be timed with automatic clock.

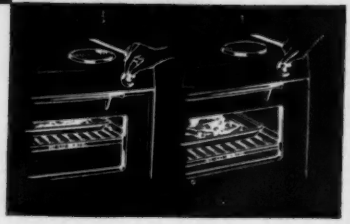


AUTOMATIC CLOCK
Gives perfect time always as a normal electric clock—and permits completely automatic absentee control of *all* operations . . . oven, Rotiss-O-Mat, Many-go-Round, Therm-O-Guard and Therm-O-Fryer or Deep Well Cooker.

THERM-O-GUARD HOTPLATE
Thermostatically controlled hotplate puts an end to boiling over or burning dry . . . makes any utensil fully automatic. Therm-O-Guard may be clock-controlled for absentee operations.



HI-LO-MATIC SHELF
Effortless precision for grilling and baking at the turn of an elevator knob outside the oven . . . the shelf can be raised or lowered without opening the oven door or juggling hot racks. The shelf rolls out at a touch.



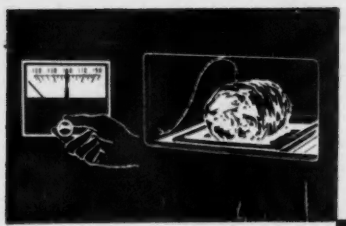
sensation!

Throughout 1960 the new range of Moffat Cookers has been featured at exhibitions and on showroom floors throughout the country. Wherever they have been displayed they have become the unchallenged centre of attraction—years ahead in features and styling. The trade has been astounded at the flood of enquiries—at the number of housewives who are now planning to become proud owners of Moffat cookers. The new Moffat range offers new, exclusive features—and housewives today recognise their supreme value in cooking convenience. The new Moffat is a sensational success—tomorrow's cooker for today's homes!

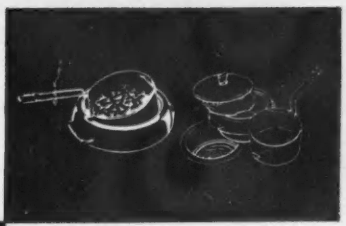
A complete range of models is available in 24", 30" and 40" sizes, as well as built-in ovens and surface units.

On top or in the oven . . . Fastest-ever heating in an electric cooker!

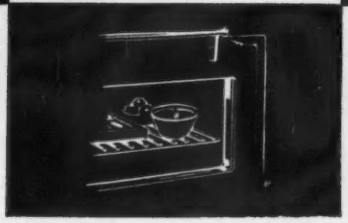
MOFFAT



◀ ROAST METER
Another brilliant innovation. Just dial your preference for any type of meat (rare, medium or well done) . . . insert the electric meat thermometer probe . . . and a buzzer signals when the roast is done to perfection.



GIANT OVEN & WINDOW ▶
The Moffat oven is twice as big as conventional ovens. It has a huge non-fogging picture window and interior light. Economical to use, it preheats to 350° in as little as 4 minutes—fastest-ever heating in an electric cooker!



▲ DEEP WELL COOKER
The multi-purpose deep well cooker can be used for boiling, steaming, baking, frying . . . all temperature-controlled, all fully automatic—thanks to Therm-O-Guard. The deep fat fryer sinks into the cooker top—completely safe and spillproof!

Moffat franchises are still open in some areas. Trade enquires are invited.

TO: MOFFATS LIMITED
1 Newman St., London, W.1

I would like to receive further information on Moffat Cookers and the Moffat franchise.

NAME .....

ADDRESS .....

.....

MOFFAT 2T/2
An Avco of CANADA Company

TRADE MARK

HIGGS MOTORS LTD.

MANAGING DIRECTOR DAVID C.Y. HIGGS, A.M.I.E.E.

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SLIP RING MOTORS up to 1000 H.P.

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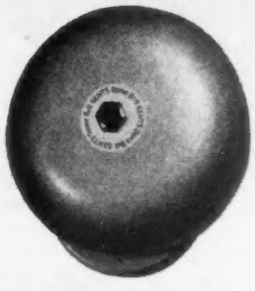
MANCHESTER · NEWCASTLE · PETERBOROUGH · SHEFFIELD · WOLVERHAMPTON

*A range you can handle with confidence !



*Not forgetting the **DOME-BELL** specially designed to give maximum efficiency in the minimum of space -plus-easy fixing.*

Yours for the asking –

Illustrated catalogue containing comprehensive information about the extensive range of industrial and domestic bells, buzzers and allied accessories made by Gents of Leicester.
You should keep a copy handy !

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IN THE FLEXIBLE CORDS FIELD TOO...

From the smallest, brightly coloured clock flexibles to tough rubber-sheathed industrial cables, A E I Cable Division has them all—V.R. or P.V.C. insulated. This yellow and black reel, symbol of the combined resources of Henley Cables, Liverpool Cables and Siemens Ediswan, is the newest container for A E I flexible cords. It is your assurance of the most comprehensive range of quality flexibles in the world. A E I flexible cords are available through 50 sales outlets throughout the country. You can rely on A E I

New yellow and black reel symbolises AEI's new combined resources and service

AEI

CABLE DIVISION

Associated Electrical Industries Limited

Cable Sales Department

51-53 Hatton Garden · London EC1 · *Telephone: CHAncery 6822*

NEWS SHEET

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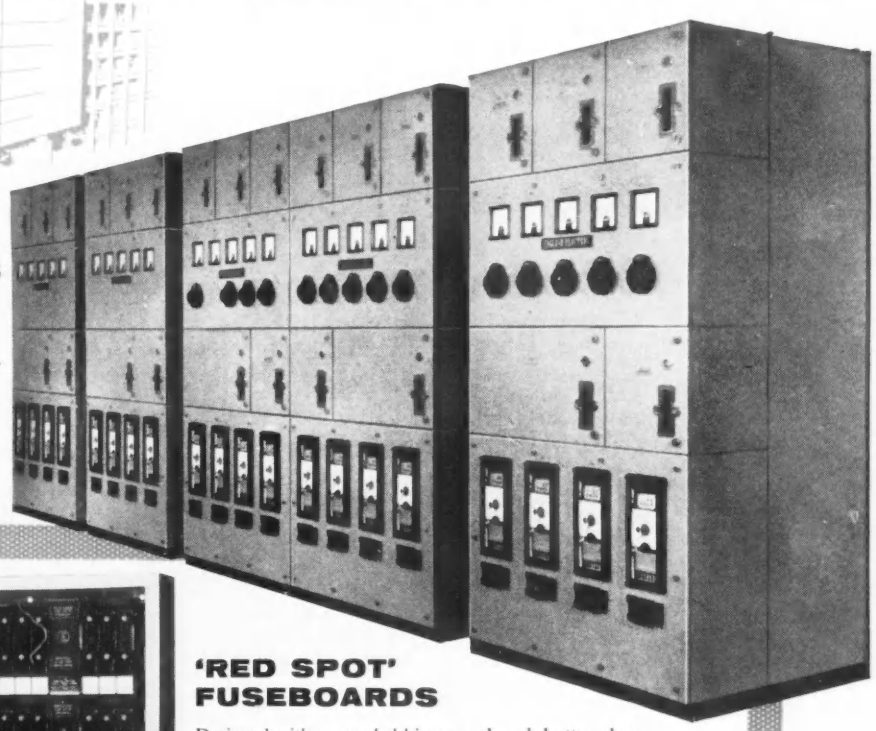
FOR MODERN BUILDINGS

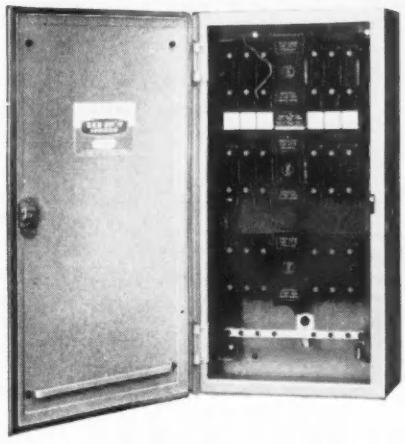
The continual increase in the use of electric power consuming devices in all types of buildings calls for well designed distribution equipment of proved performance. 'ENGLISH ELECTRIC' meet these requirements with their 'Superform' Switchboards and 'Red Spot' Fuseboards.

EASY TO INSTALL • EASY TO MAINTAIN
SAFE TO OPERATE • OF PLEASING APPEARANCE

'SUPERFORM' SWITCHBOARDS

These switchboards have all the 'live' metal insulated, including busbars, interconnections, cable terminations, instrument and meter terminals, switch contacts and terminal blocks. Thus spare switches included on the switchboard can be cabled up safely with the existing circuits in operation.





'RED SPOT' FUSEBOARDS

Designed with concealed hinges and push button door catch having provision for locking by means of a built-in cylinder lock, 'Red Spot' fuseboards have the busbars and incoming cable sockets fully insulated. The fuse contacts and fuse terminals are covered by insulated shrouds. These features provide safety to electrical personnel by enabling spare fuseways to be cabled up with the busbars alive.

'ENGLISH ELECTRIC'

fusegear

FOR DESCRIPTIVE LITERATURE WRITE TO:

The English Electric Company Limited,
Fusegear Division,
East Lancashire Road, Liverpool, 10

THE ENGLISH ELECTRIC COMPANY LIMITED, ENGLISH ELECTRIC HOUSE, STRAND, LONDON, W.C.2
WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

FG.58

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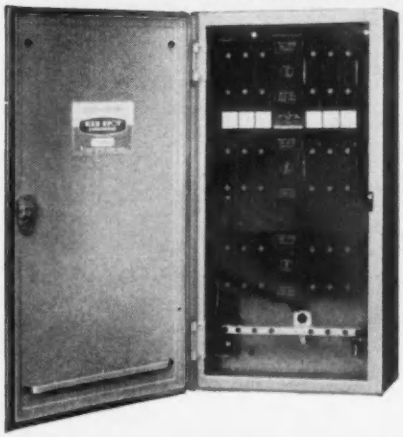

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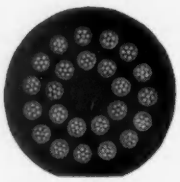
FG.58

C

J. & P.

Silicone Rubber Insulated Cables...

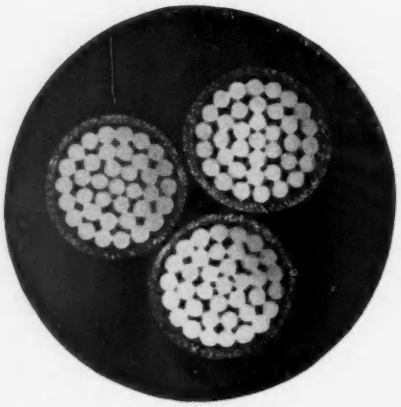
...for nuclear-powered submarine 'Dreadnought'



24 Core 7/.0124" copper conductor, filled strand, silicone rubber insulated and glass braided cores, cable laid up with special filling compound, p.c.p. sheathed.

It is significant that the Admiralty commissioned J. & P. to design and manufacture the special silicone rubber insulated cables to be used throughout the first British nuclear-powered submarine. The cables are designed to withstand a water pressure of 200 p.s.i. in the event of a compartment of the submarine being flooded.

The 3,500 ton "Dreadnought" will have a primary role as a submarine hunter-killer and be equipped with the latest underwater weapons and detection equipment. She will be fitted with inertial navigation and with a means of measuring her depth under ice to allow passage beneath the Earth's polar ice caps.



3 Core 37/.103" filled strand, silicone rubber coated glass fibre tape insulation, barrier tape, cores laid up with special filling compound, p.c.p sheathed.

KEY TO DRAWING

1. Hydroplane
2. Torpedo Tubes
3. Torpedo Compartment
4. Officers' accommodation
5. Crew accommodation
6. Stores compartments
7. Pump compartment
8. Control compartment
9. Captain's accommodation
10. Wash places
11. Galley
12. Battery compartment
13. Reactor
14. Machinery control compartment
15. Main machinery compartments
16. Turbine gearing
17. Motor

JOHNSON & PHILLIPS LTD. ELECTRICAL ENGINEERS & CABLE MAKERS
CHARLTON · LONDON · S.E.7

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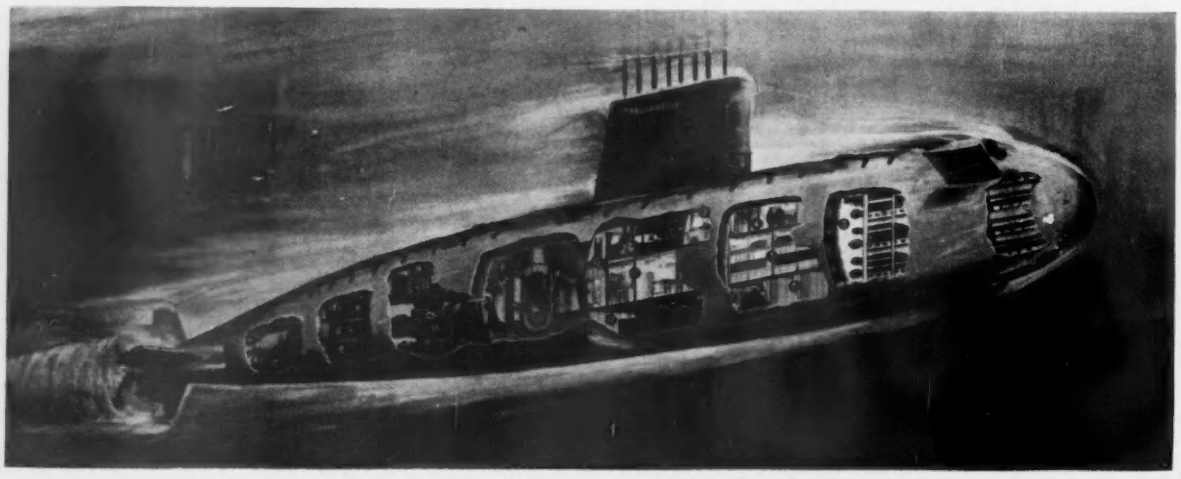
Overseas Factories in AUSTRALIA, SOUTH AFRICA, PAKISTAN, and INDIA (in association with Balmer, Lawrie & Co. Ltd.)

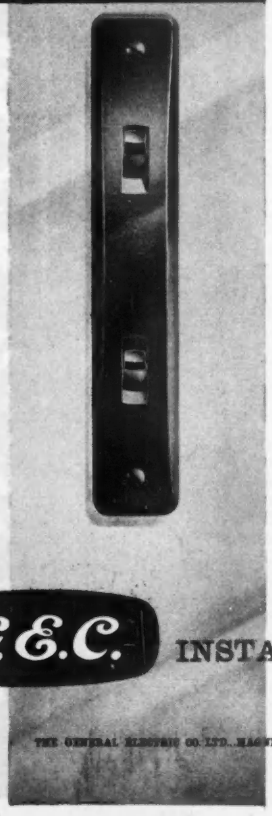


Mutac Clipper switches have been accepted by the Council of Industrial Design for Design Index—so architects, consulting engineers and contractors are choosing them for their good looks, as well as for their functional efficiency and easy assembly.

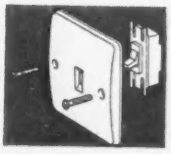
just a minute!

that's all it takes to instal the 'MUTAC CLIPPER'

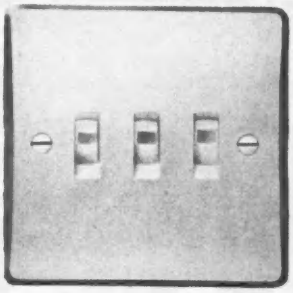
ARCHITRAVE SWITCH ASSEMBLY



Take either a 'Mutac Clipper' plaster depth or architrave switch plate and select the required switch, bell push or pilot light. Simply press home the spring clip with a small screwdriver and a fixed plate assembly is ready for installation. Available in 1, 2 or 3 gang for plaster depth and 1 and 2 gang for architrave. 'Mutac Clipper' switch assemblies will cut installation costs and save time as additions and alterations can be made with the minimum of effort.



PLASTER DEPTH SWITCH ASSEMBLY



G.E.C. INSTALLATION EQUIPMENT GROUP

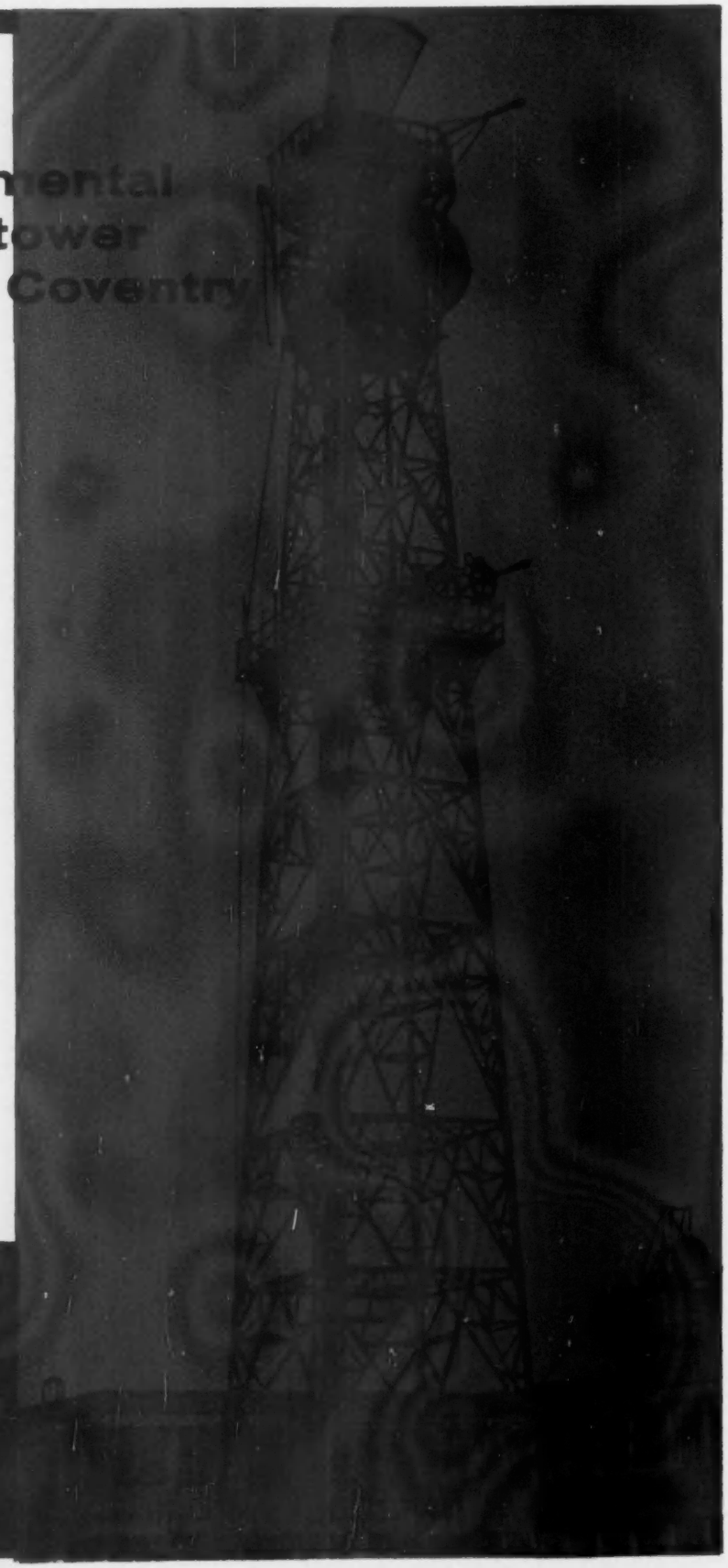
THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2

SWITCH AND FUSE GEAR
H.R.C. FUSES
OVERHEAD BUSBARS
RISING MAINS
CONDUIT
PIRELLI GENERAL CABLE
CABLE TRUNKING
UNDER-FLOOR CABLE DUCTS
ELECTRIC WIRING ACCESSORIES
BELLS

experimental radio tower for G.E.C. Coventry

This 153 ft. high tower, weighing 33 tons, was commissioned by the General Electric Co. Ltd. for advanced experimental work in connection with U.H.F. and V.H.F. Radio Transmission at their Telephone Works, Coventry. Pirelli-General Overhead Lines Department carried out the design, supply and erection of the tower which was fabricated by William Baines & Co. Ltd. to detailed designs and specification supplied to them.

Pirelli-General Overhead Lines Department, in addition to installing the necessary foundations and cables, also supplied and erected the Horn-Paraboloid Reflector at the tower top.



PIRELLI-GENERAL

CABLE WORKS LIMITED

SOUTHAMPTON AND EASTLEIGH

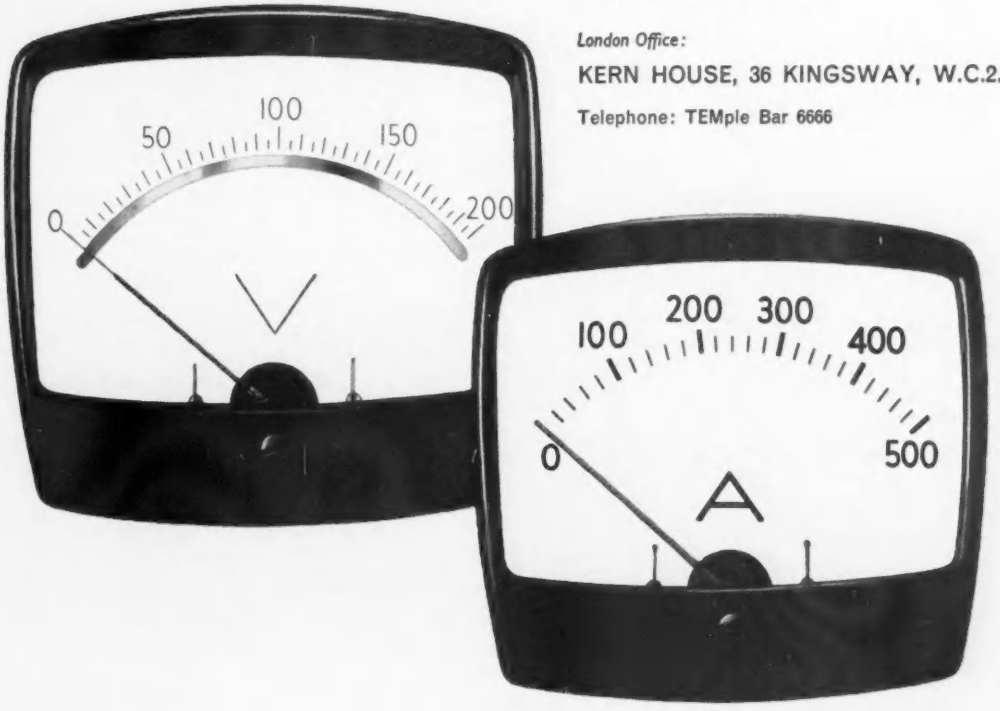
pg

Faces for Cases

Elegant cases and legible faces give these Ferranti Style 'A' instruments a contemporary look, but they are more than good looking! Robust in construction, and designed to give minimum rear projection, they are interchangeable with standard $2\frac{1}{2}$" and $3\frac{1}{2}$" round flush instruments and are available with fine scale with or without mirror or bold scale.

FERRANTI LTD · MOSTON · MANCHESTER 10
Telephone: FAllsworth 2071

London Office:
KERN HOUSE, 36 KINGSWAY, W.C.2.
Telephone: TEMple Bar 6666



FERRANTI
FIRST INTO THE FUTURE

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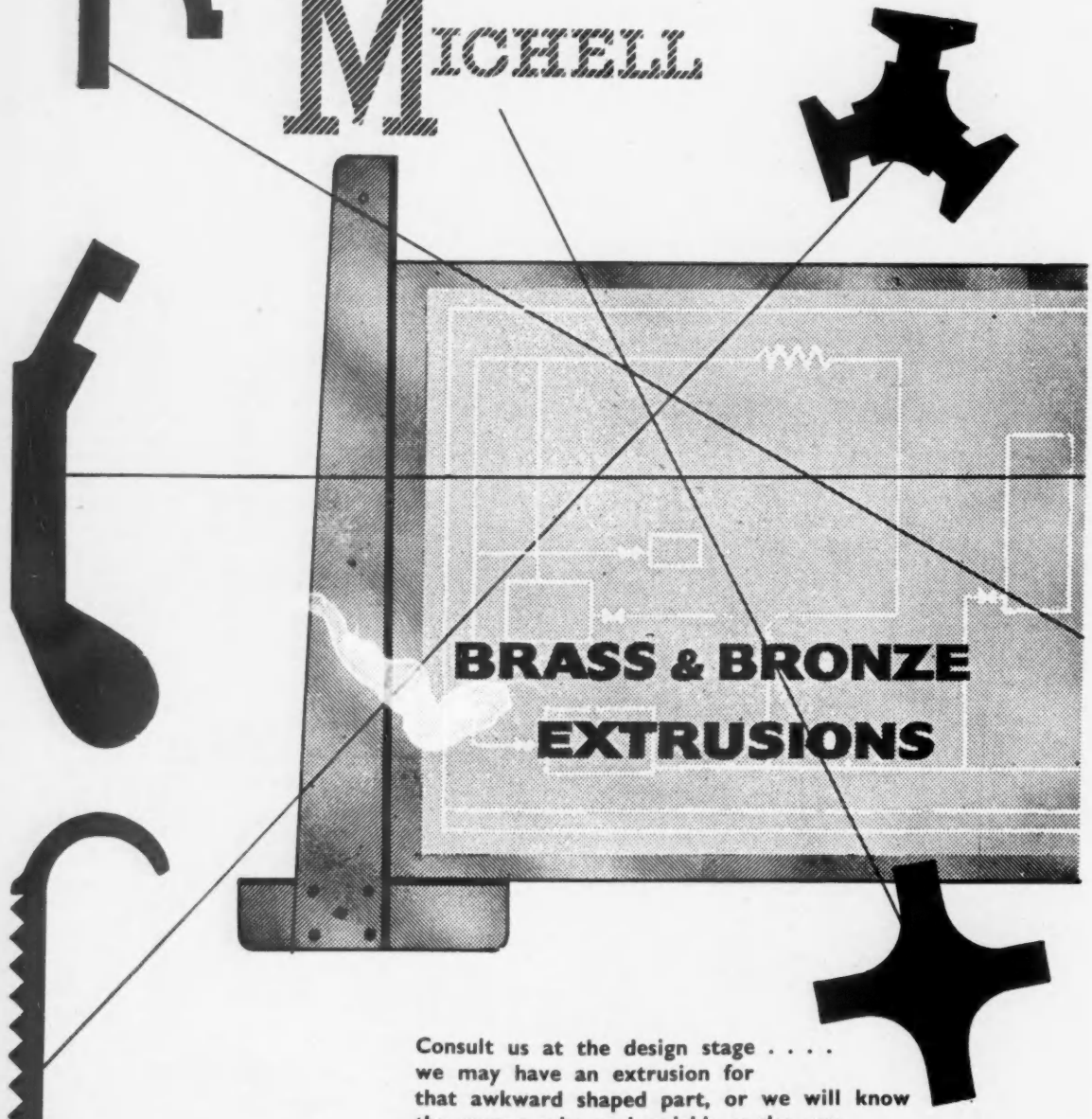
HOLMAN MICHELL



Consult us at the design stage . . . .
we may have an extrusion for
that awkward shaped part, or we will know
the reason why and quickly make one.
Rounds, squares, hexagons are available
in stock, ready for delivery by our own transport.
We also manufacture lead
sheet and pipe.

HOLMAN, MICHELL & CO. LTD.

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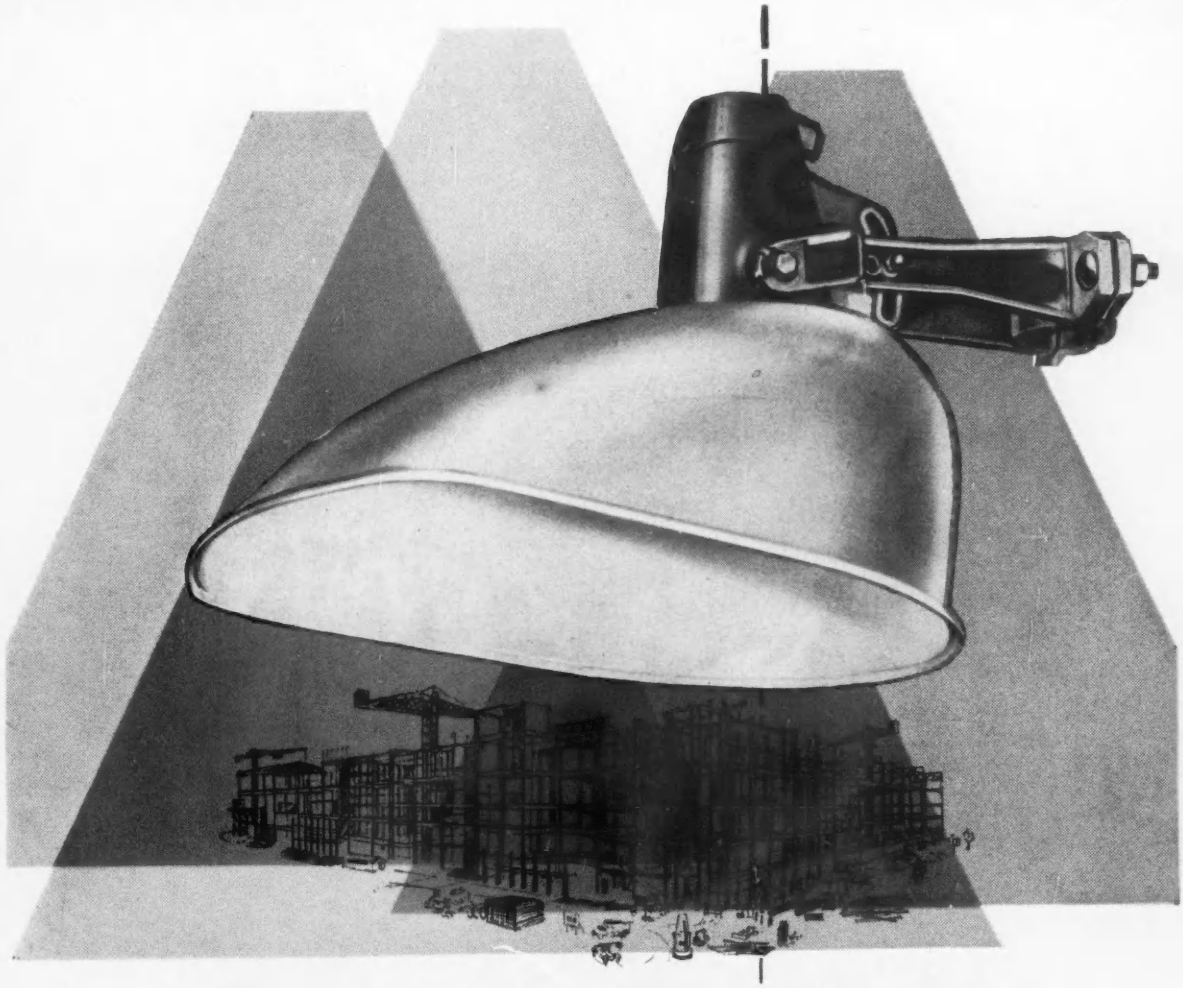

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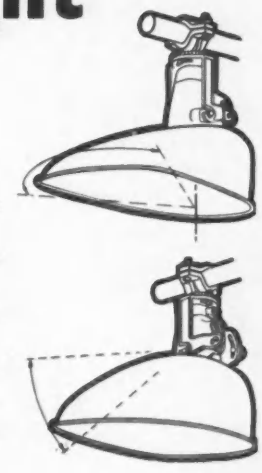

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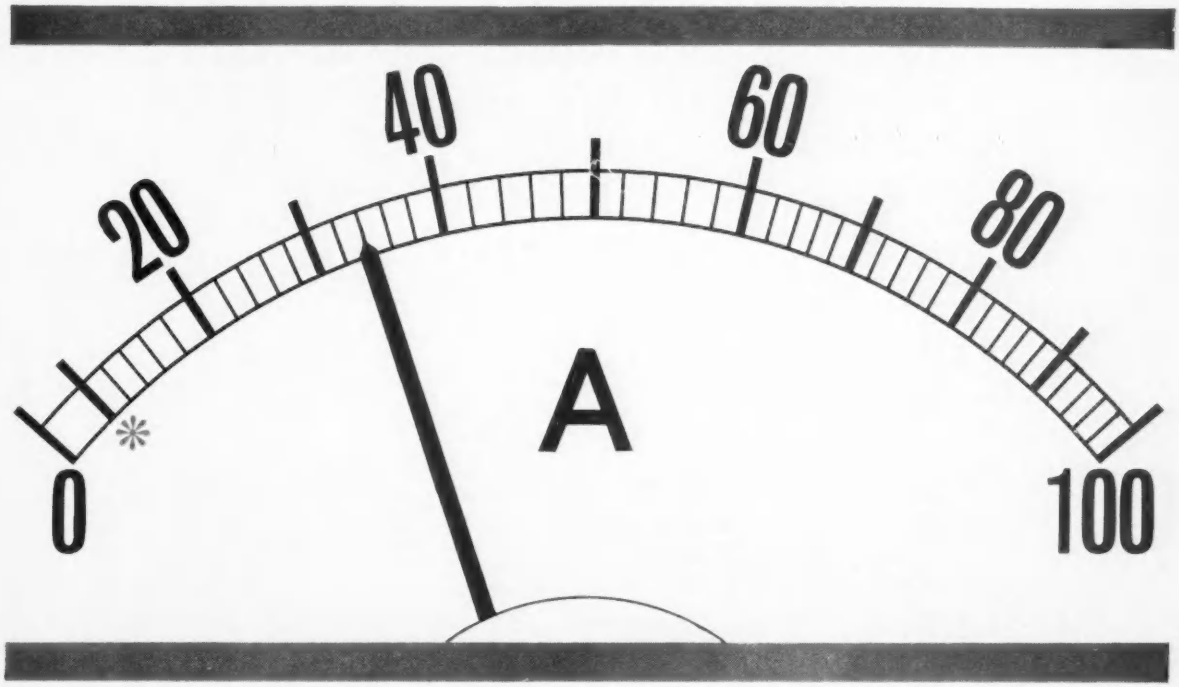

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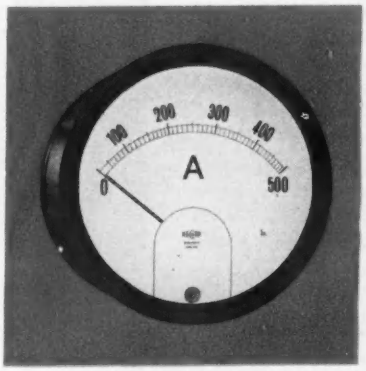

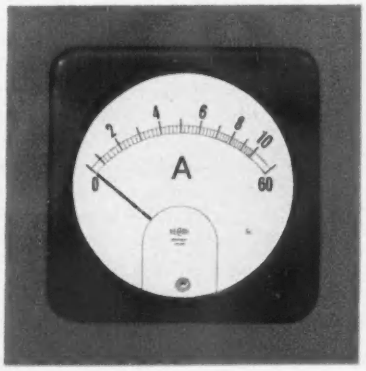

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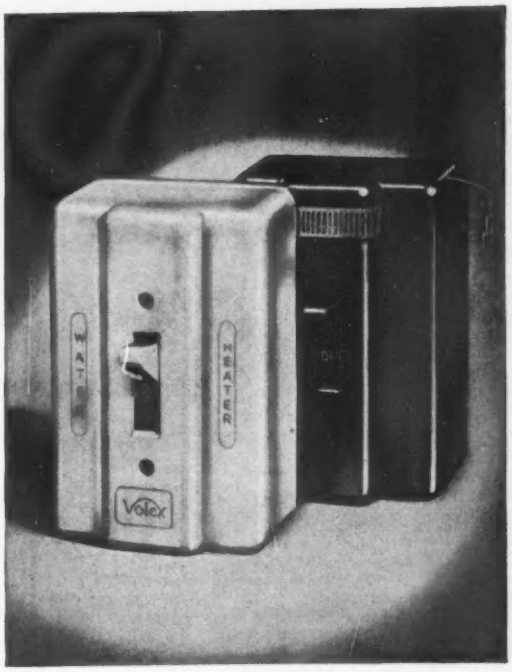

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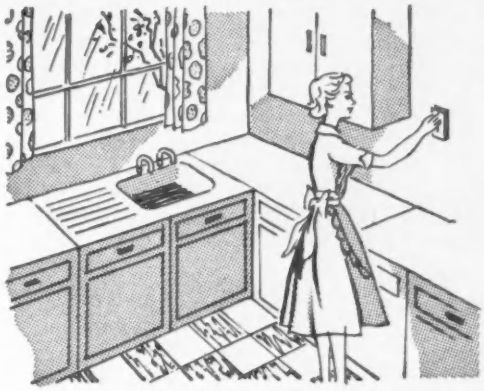

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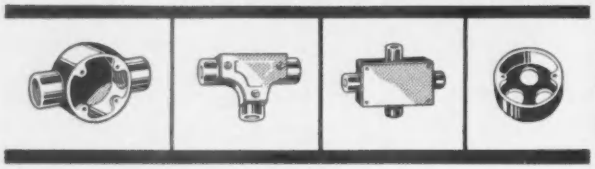

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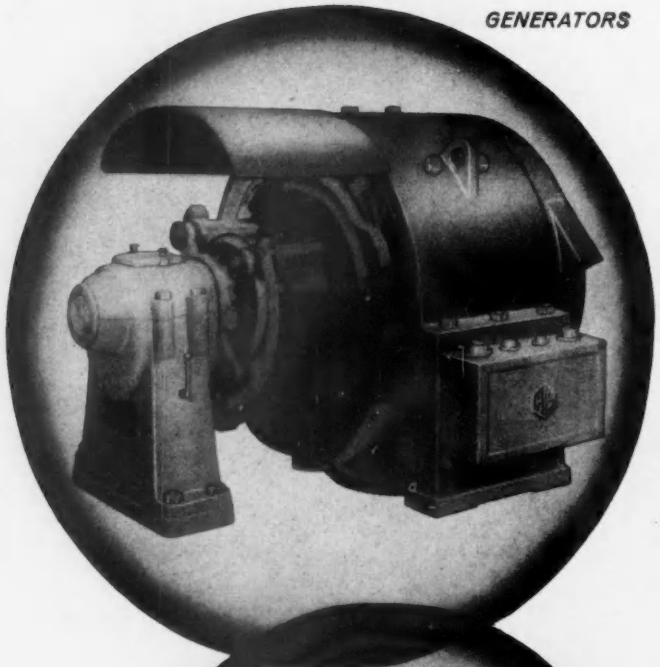

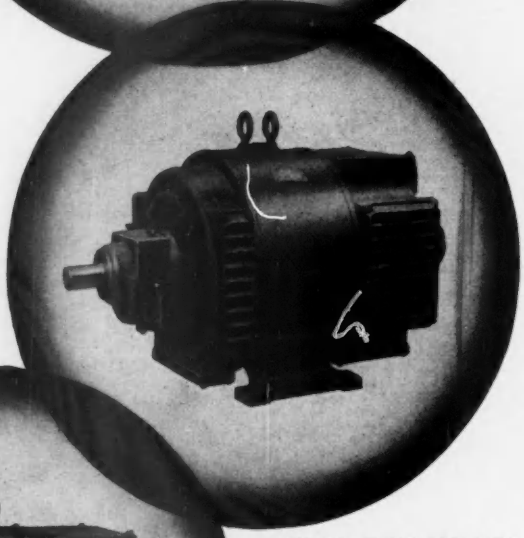

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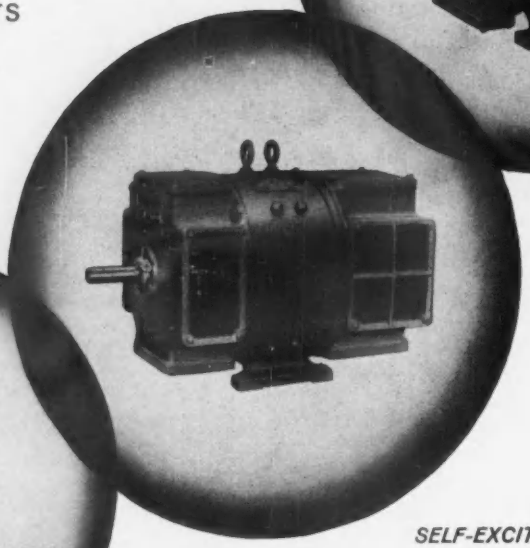

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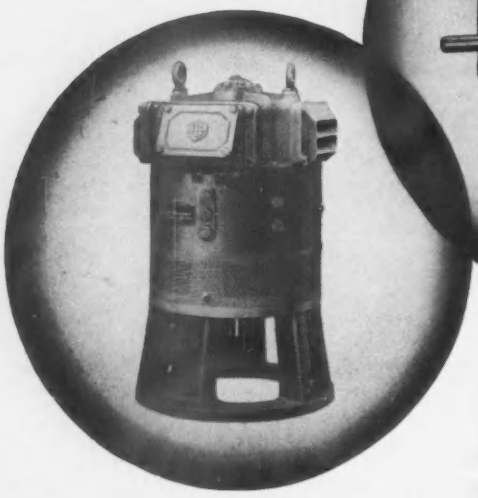

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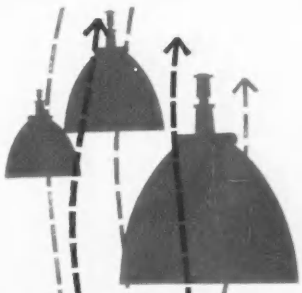
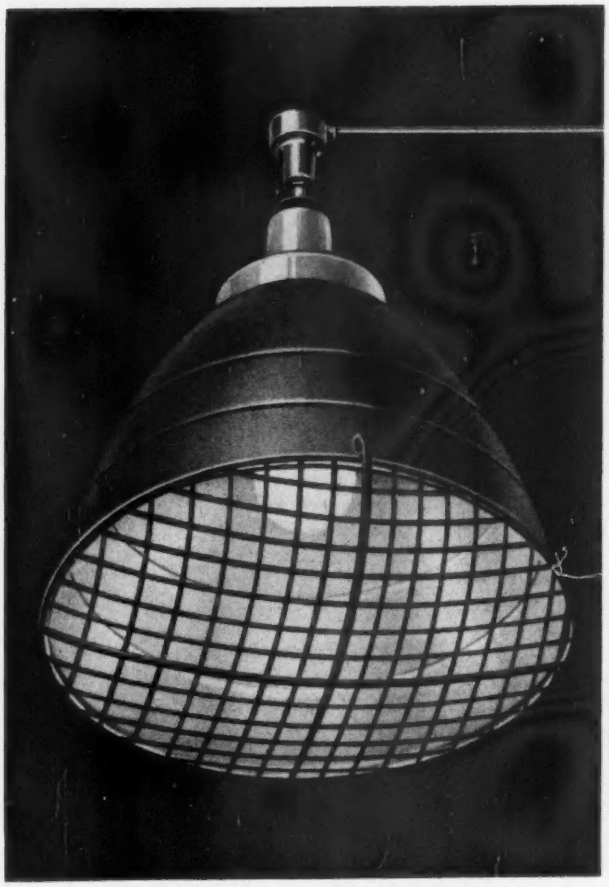


new self-cleaning high bay lighting



The new Simplex Airflo fitting gives you increased efficiency plus greater adaptability. It is pleasantly contoured; weighs only 10 lbs complete with Simplex Discon* device fitted for extra ease of installation and maintenance.

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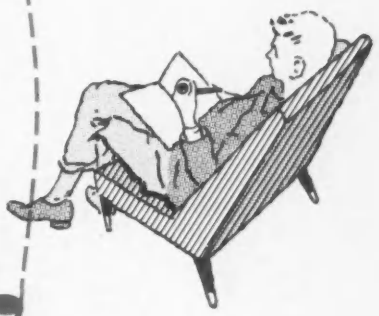

'AirFlo'

*The Simplex Discon device allows instant connection to or disconnection from the conduit system without disturbing wiring or lampholder. Leaflet L.2192 gives full details.

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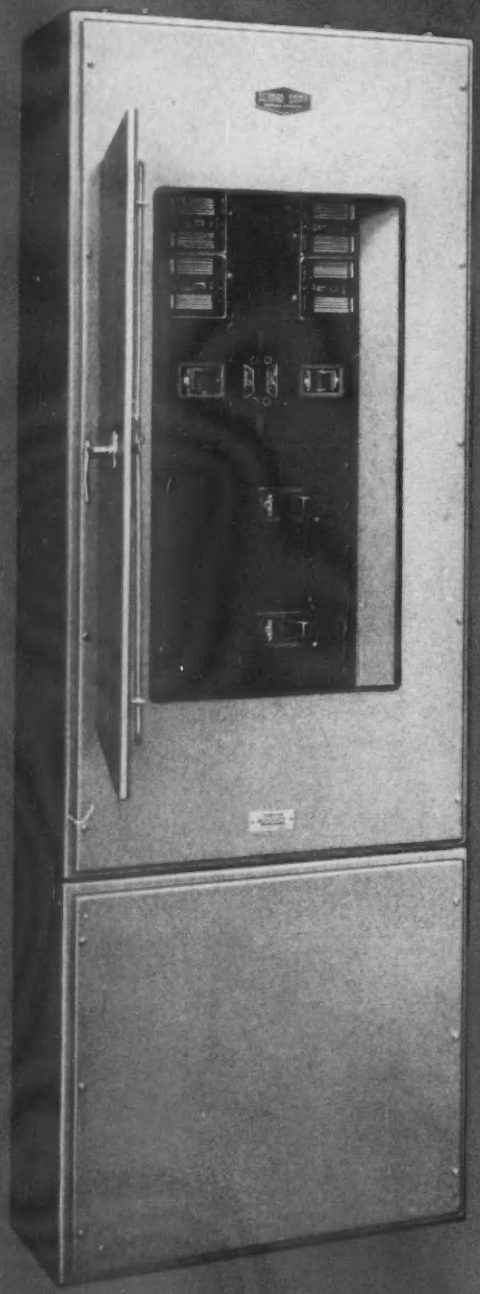

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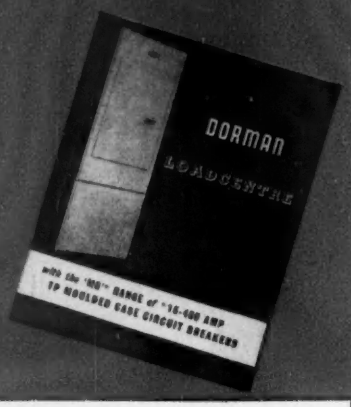

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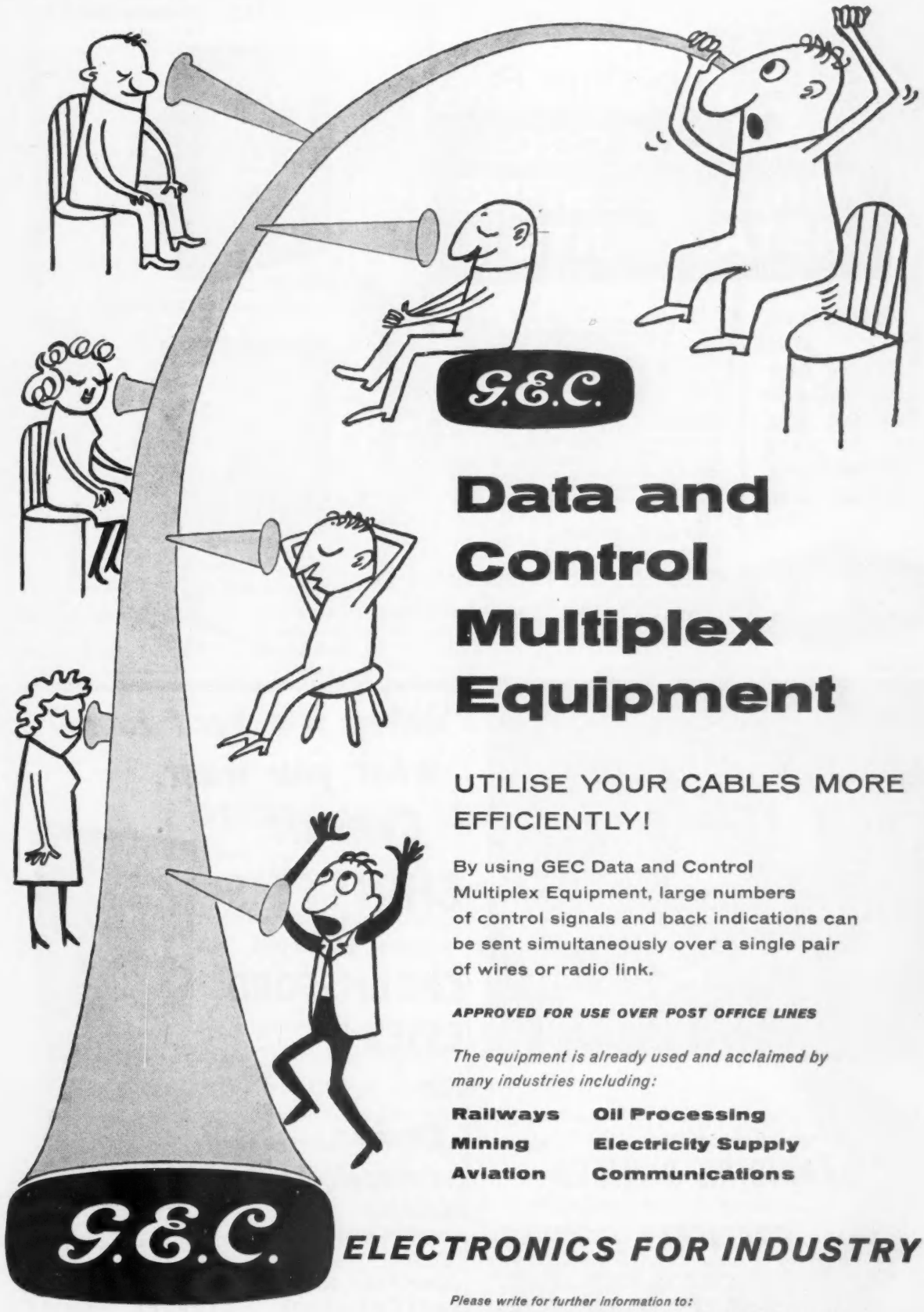

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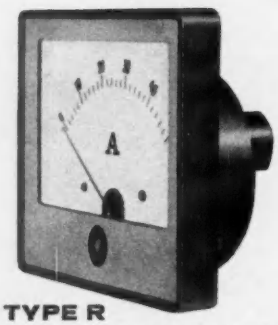

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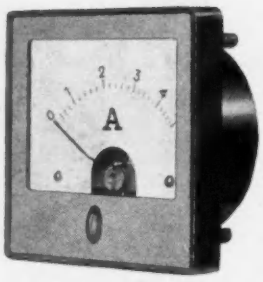

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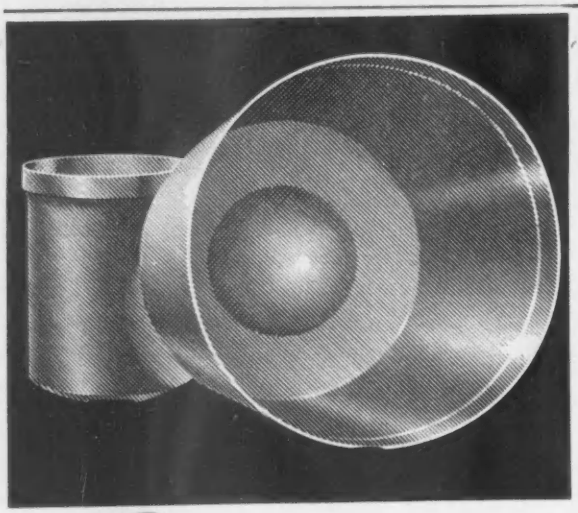

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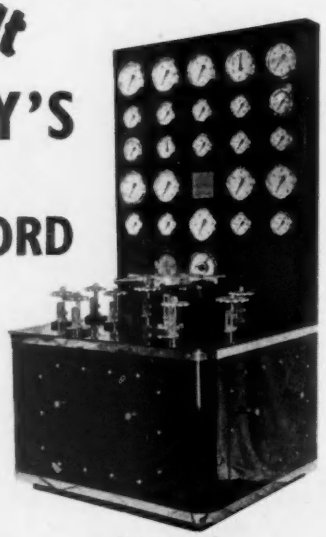

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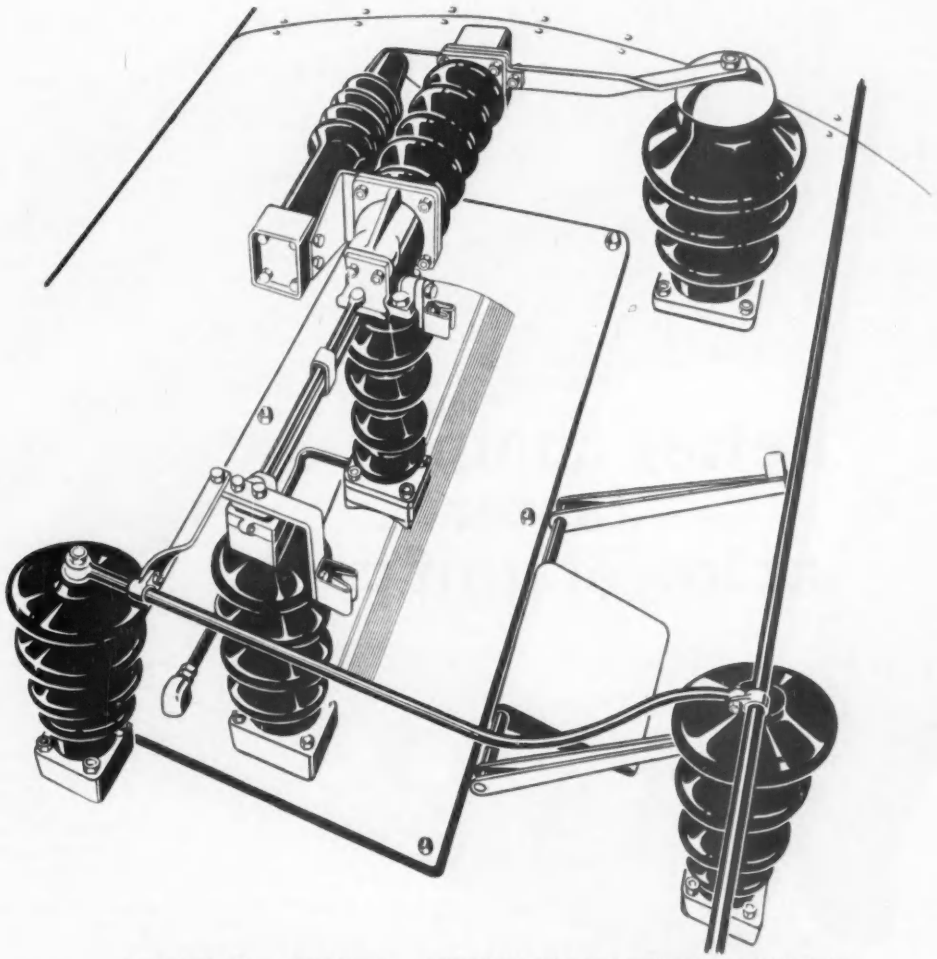

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Dans ce numéro

L'éclairage dans un Palais du Désert 871

Un palais contemporain du désert construit à l'intention d'un riche souverain, offre maintes opportunités pour la création d'effets d'éclairage plutôt hors de l'ordinaire. Une route d'accès illuminée par des rangées continues de tubes fluorescents installés à une hauteur de bordure de trottoir, à un niveau si bas que l'on peut avoir l'impression de rouler sur "un océan de lumière." Les tubes fluorescents sont installés au-dessus d'un plafond de tuiles légères perforées en plusieurs endroits. Des dispositifs de filaments tungstènes en cuivre bruni sont employés pour donner un effet de dessins traditionnels orientaux.

Alternateurs Marins Autorégulateurs, 1ère Partie ... 877

La conception d'un alternateur autorégulateur entraîne la nécessité de compenser pour la variation de la force de réaction magnétomotrice d'armature attribuée à la charge du courant et à l'élément de force. La combinaison des deux éléments de courant inducteur est obtenue ordinairement par l'usage d'éléments statiques du côté courant alternatif à l'aide de redresseurs statiques alimentant le circuit inducteur. Il est cependant décrit un système où seul est fait l'emploi de compoundage de charge de courant, et où est incorporé un régulateur automatique statique de voltage.

Bruit causé par le Transformateur 881

Le mesurage de vibration démontre que le bruit d'un transformateur est le résultat d'oscillations complexes au noyau, causées par des variations de magnétostriction, de perméabilité et de transfert de débit entre les laminations. Afin de réduire le bruit causé par la production des recherches approfondies sont requises en ce qui concerne les propriétés de l'acier de noyau. Une construction spéciale peut réduire la radiation du bruit émanant des transformateurs. Nous décrivons dans cet article une presse automatique pour le poinçonnage précis de laminations en acier à grains orientés.

In dieser Nummer

Palastbeleuchtung in der Wüste 871

Der Auftrag, die Beleuchtung für ein modernes Palastgebäude in der Wüste zu entwerfen, fordert förmlich zur Schaffung des ungewöhnlichen an Lichtwirkungen auf. Die Beleuchtung einer Zufahrtstrasse z.B. mittels einer durchgehenden, in Randsteinhöhe angelegten Soffitenbeleuchtung mit wagerechter Abschirmung ruft den Eindruck hervor als ob man auf einem Meer von Licht fahren würde. Eine interessante Neuerung besteht in der Anbringung von Leuchtstofflampen oberhalb einer in Leichtbauweise ausgeführten, hängenden Decke, die eine grosse Anzahl von Aussparungen aufweist. Mit Wolframglühfaden ausgestattete Beleuchtungskörper werden in poliertem Kupfer ausgeführt um eine Anlehnung an traditionelle orientalische Muster zu ermöglichen.

Selbstregelnder Schiffswechselstromgenerator, I ... 877

Ein selbstregelnder Wechselstromgenerator muss so konstruiert sein, dass jede vom Belastungsgrad wie vom Leistungsfaktor bedingte Schwankung der durch Ankerrückwirkung entstehenden Umlaufspannung wirksam ausgeglichen wird. Eine Zusammenlegung der zwei Komponenten des Kompensationsfeldstroms wird meistens dadurch bewerkstelligt, dass wechselstromseitig statiche Teile und zur Speisung des Erregernetzes ruhende Gleichrichter verwendet werden. Bei einer der beschriebenen Bauarten jedoch wird die Kompoundierung ausschliesslich durch den Belastungsstrom bewirkt, während die automatische Regelung durch statischen Spannungsregler erfolgt.

Transformatorgeräusch 881

Untersuchungen am Vibriertisch haben ergeben, dass Transformatorgeräusche auf äusserst kompliziert zusammengesetzte Schwingungen im Kern zurückzuführen sind, die ihrerseits durch Schwankungen der auftretenden Magnetostriktion sowie der vorhandenen Permeabilität und der zwischen den Blättern fliessenden Kraftströmung bestimmt werden. Um die Geräuscherzeugung herabzusetzen bedarf es einer grossangelegten Untersuchung der Eigenschaften des Kernstahls. Durch besondere Massnahmen baulicher Art lassen sich die von Transformatoren ausgestrahlten Geräuschwellen vermindern bzw. dämpfen. Der Artikel befasst sich ausserdem mit einer automatischen Presse zum genauen Ausstanzen von Kernblättern aus kornorientiertem Stahl.

ELECTRICAL TIMES

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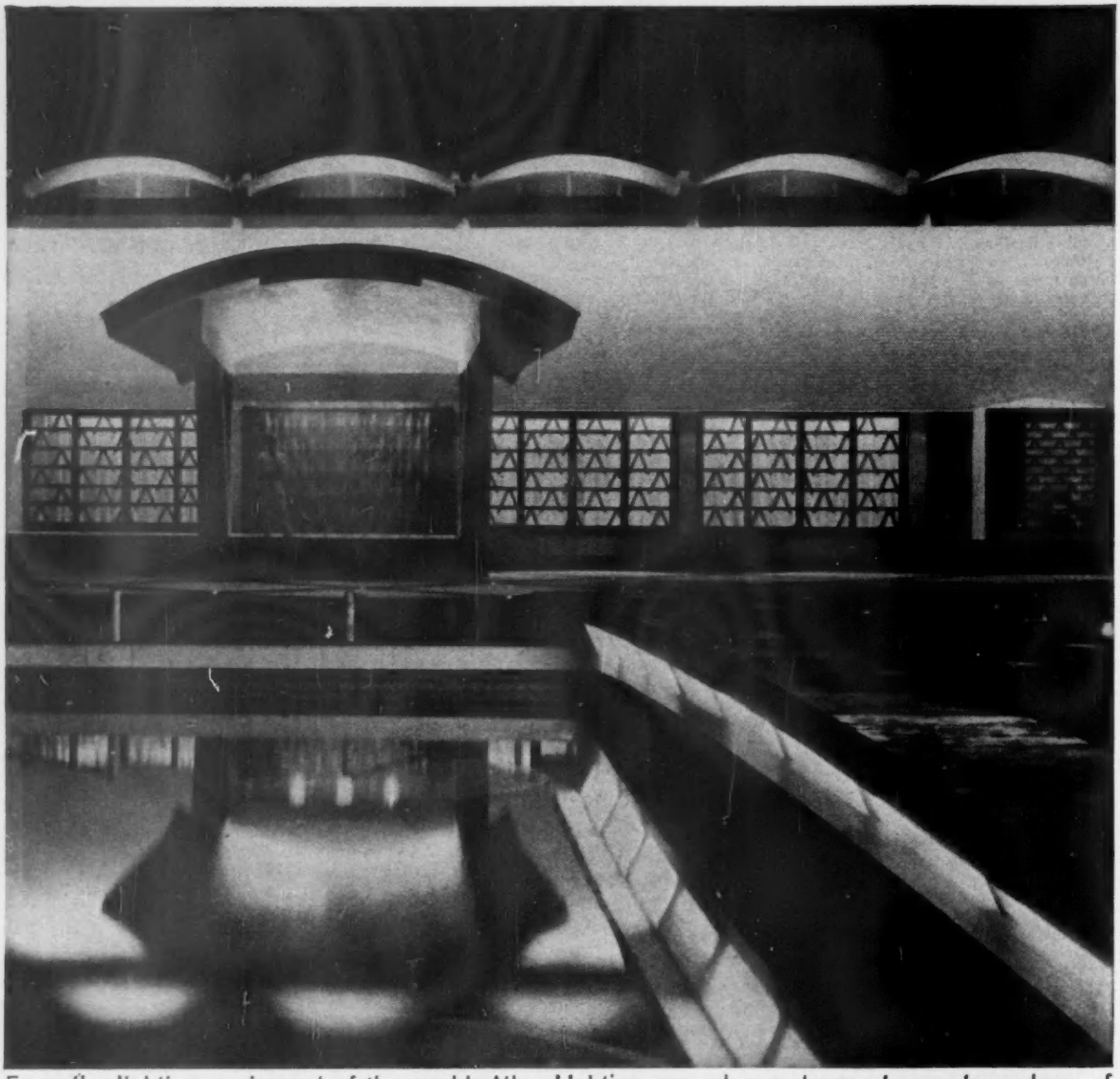

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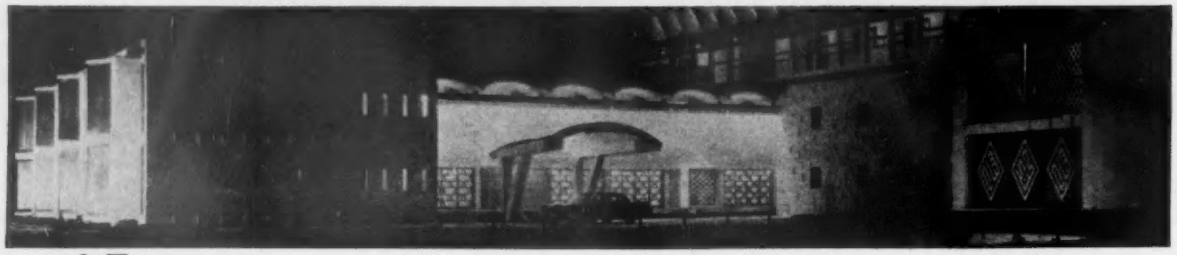
A PALACE IN THE PERSIAN GULF

Architects: Farmer and Dark



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ELECTRICAL
TIMES

ESTABLISHED 1891

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Editor and Managing Director:
ROY BALDWIN, M.I.E.E., Barrister-at-Law

Joint Editor:
K. C. POUNDS, B.Sc.(Eng.), A.C.G.I., A.M.I.E.E.

News Editor:
T. W. WRIGHT

Comment

YARDSTICK ON APPLIANCE SALES

The most comprehensive study yet of three main domestic electrical appliances (and television) was published last week by the National Institute of Economic and Social Research and summarised in our last issue. This survey comes at an appropriate time for the industry, when there is need for serious heart-searching, but it brings little consolation. It suggests that for washing machines and vacuum cleaners and refrigerators, present productive capacity is in excess of any demand that is likely to arise within the foreseeable future. Nor can too much be hoped for from changes in Government policy. If hire-purchase restrictions were removed entirely it is considered that sales of washers might rise by 10% and cleaners by less than 5%; for every 1% change in price (including purchase tax) sales vary by 1% to 2%. Although regression coefficients have been determined for h.p. and price for these two appliances, this has not been possible in the case of refrigerators. This appliance has the lowest saturation and only recently have sales been moving towards the larger markets of the lower income group. None the less, the top sales figure is put at 1·4 million a year because there will be little immediate replacement demand. In coming years, replacement demand will become of paramount importance for washers and cleaners, the curve rising more steeply in the former case, but both reaching about 75% of home sales by 1970. This, perhaps, is the more important lesson that the industry has to learn from this major exercise in statistics. If, by outstanding advance in design, new appliances can be made so attractive that the effective life in consumers' hands of older appliances can be reduced, so that they are replaced for obsolescence rather than decrepitude, there must be an acceleration in the replacement market. This challenge would be severe under any circumstances, doubly so for a section of the industry that has not distinguished itself in recent years for native originality.

DIESELS NOT THE ANSWER?

Rumours about what the Government will decide on the future of British Railways' London Midland modernisation scheme abound at present, with an official announcement expected daily. In particular, the possibility that electrification may be dropped is being widely discussed. But if electrification is abandoned it will be against the advice of the committee of MPs who have most closely studied the question and also against the judgment of the British Transport Commission. And what of the alternative? Use of diesels has the immediate attraction of lower initial capital investment, but anyone who presses that solution must take pause

from the review of experience with diesels on US railways which an American consulting engineer presented to the Institution of Mechanical Engineers last week. Analysis of financial statistics after 20 years of operating diesels brings no support for the claim often made that they are producing a 30% return on the investment made in them. Indeed, a break-down of costs suggests that for main line applications the saving on diesels in comparison with steam locomotives compares unfavourably with annual charges on the capital involved. Further, although the paper is concerned only with a comparison of steam and diesel locomotives, it is clear from what it has to say that some of the ways in which diesels fall short of expectations would not apply to electric locomotives. Discussion on the paper showed that some of its conclusions are not readily accepted here, and the author has since commented favourably on British diesel-electric design in comparison with American. As against that, US experience includes at least one reversion from dieselisation to electrification.

SCHOOLS MINISTRY WAS WRONG

One of the many prejudices off-peak heating has had to fight is an official Ministry of Education ruling that it is unsuitable for school heating. Scottish experience might have been accepted as indicating the improbability of this but, instead, facts and figures have been demanded and on the first few results storage heating was proscribed. Now a convincing demonstration that the claims of storage heating to consideration in this field cannot be summarily dismissed has come through Electricity Council trial installations. Results show clearly that with block storage heaters installed in schools of pre-1914 construction, the overall costs of hot-water radiator systems can be matched, even at the comparative fuel prices applying two years ago. More recent changes in fuel and labour costs probably shift the balance more definitely in favour of electrical methods; but the essential point of the test is clearly established. It is that there is little basis for a claim that hot-water heating is so overwhelmingly more economical than storage electrical heating that the latter should be ruled out by Ministerial ukase. Early adjustment to the Ministry's advice to local authorities on this point must now be sought.

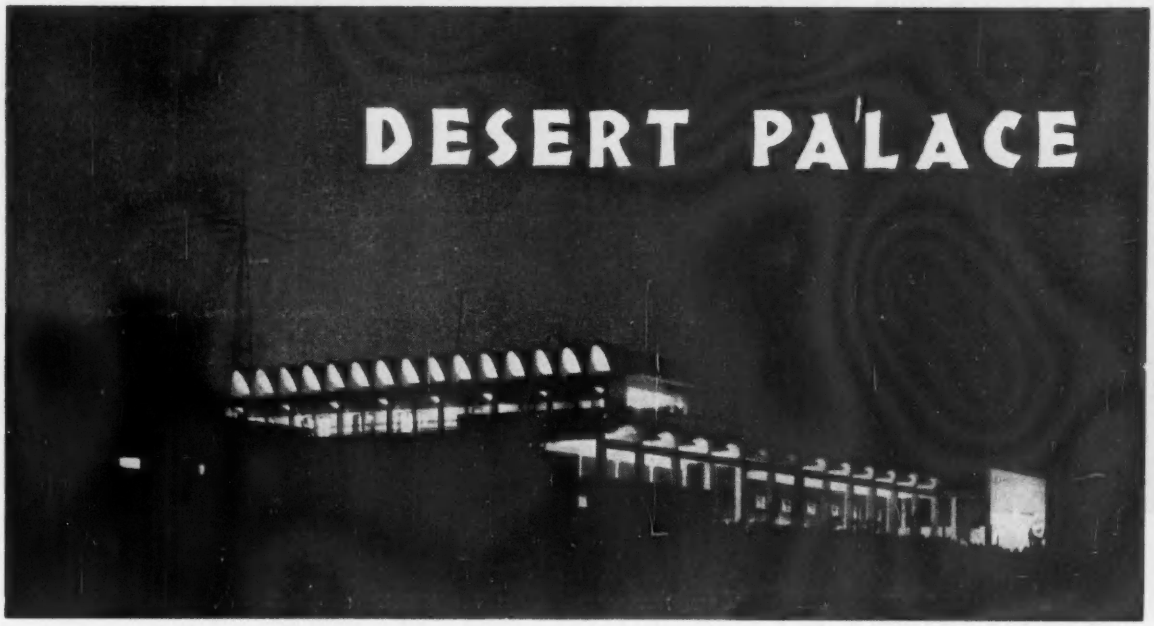
HOW TO WIELD THE H.P. WEAPON

In recent months the electrical manufacturing industry has indicated to the Government that it would rather have stability in hire-purchase legislation so far as size of initial deposits and limitations on hire periods is concerned, than freedom from all restrictions for much of the time, interspersed with suddenly introduced sharp limitations. The reason is clear. Industry has to invest so much in producing a major domestic appliance that it wants to be able to estimate its market; and few factors are so likely to upset an estimate as a change in h.p. regulations. Last week the Government, through a Parliamentary answer, flatly rejected the idea. Despite soft words about the desirability of assisting forward planning by industry, it was made clear that the Government thinks the h.p. weapon too valuable an instrument of its armoury for fighting economic upsets to be discarded. Once that stand is taken, however, emphasis is given to another criticism of the Government in relation to h.p. Is the weapon being wielded to the best effect? There is a strong suspicion that the impact of this essentially blunt instrument comes too brutally and too late. More frequent changes smaller in magnitude would reduce the margin for error in its use—and reduce as well the upset to manufacturers. It has to be remembered in this context that the situation will never be the same as in the last h.p. boom. Finance houses, having burnt their fingers through bad debts then, are likely to proceed more soberly in future.

ECONOMICS OF R.P.M.

Most writing by professional economists on the subject of resale price maintenance damns the practice. The arguments as presented fit together snugly enough but seem to most people engaged in business to be somewhat lacking in reality. A rational explanation for that impression comes in a booklet, *Fair Trade*, published by Macmillan's last week. The authors are two professional economists who feel that their fellows have overstated the case for prohibiting RPM. In the preface to their work they say how initially they wished to show that the case for a Government ban on RPM was not so "open and shut" as the tone of most critics suggested. By the end of their exercise in devil's advocacy, they find themselves in a more advanced position, impelled by their own argument to declare their belief in a general case for the retention of individual RPM. Between these points of different emphasis appears to have come the application of the traditional scientific method, the checking of hypotheses against all relevant available observations —a technique that has not been exploited with any notable vigour by those who have argued against RPM. Information available includes some detailed reports of North American experience when RPM has been made illegal or ineffective. From this it is clear that major domestic electrical appliances are particularly vulnerable to the price-cutting and loss-leader tactics of large stores once RPM is abandoned. That vulnerability, once exploited, results in long-term losses to manufacturers which is not balanced by any sustained advantages to the purchasing public. In the UK, traders must wonder whether the facts they are reporting are giving a similar impression to the officials of the Board of Trade, currently carrying out an inquiry into RPM in Britain. On that may depend the pattern of retail trading here during the next decade.

This week's quick summary of electrical news faces advertisement page 20



EXPERIENCES OF A MODERN GENIE

by R. W. Shaw,* M.I.E.S., M.J.Inst.E.

IN my youth I was an avid reader of *Tales from the Arabian Nights*, those fabulous stories in which, on occasions, a genie would appear and carry out the most fantastic tasks in an incredibly short time. I often tried to imagine the picture from the genie's point of view. How did he plan his operations? Did he have assistance from other genii? What were his labour problems? Today, I think I may have the answer to at least some of these questions.

Palace in the Desert

It all began with a visit to the house of an architect genie one evening late in 1958. It seemed that a powerful sheik had summoned him and ordered: "Build me a palace —there!"; "there" being a spot in the desert some miles from a town. From the plans he laid before me it was evident that he was an imaginative and contemporary fellow. It would be my task to light the palace and surroundings in the most modern style. I had a completely free hand.

The palace was to be built on a low, man-made hill, some 12 ft high, faced with black stone. It would have the usual quarters for the sheik and his family, a wing for guests, a block for the servants, walled gardens, swimming and fountain pools and an entrance courtyard. As we discussed the plans and he described the details, first ideas rapidly began to form and take shape. Equipment was ordered and dispatched to the site, where construction was pressing ahead. In October, 1959, I flew (but not by magic carpet) to the Persian Gulf and made my way to the palace. In the succeeding weeks, installation and erection of the equipment went ahead while new ideas were born, developed, executed and added.

Now let us suppose that the palace is complete—as, indeed, it now is—and that we are approaching it on a fine, dark Arabian night. We shall discuss the problems as we go.

Leaving the main road stretching out across the desert, we take the special road to the palace where, ahead, a 30 ft illuminated pylon stands shining. This is a brass framework, polished and waxed, built around a central 3½ in. steel tube supported on a concrete foundation 12 ft deep in the desert sand. White glass panels protect the 24 4 ft 40 W "Tropical Daylight" fluorescent tubes which are installed, together with the starter switches, inside the pylon. These are the only units with starter switches in the palace, all other fluorescent lighting incorporating quick-start gear. Because of the hot noonday sun, the ballast gear is housed in a ventilated enclosure in the guard house, of concrete faced with marble, which stands at the entrance to the palace road.

* Senior Commercial Engineer, Atlas Light and Lighting Ltd.

Low level lighting on the palace road gives an impression of riding on a sea of light

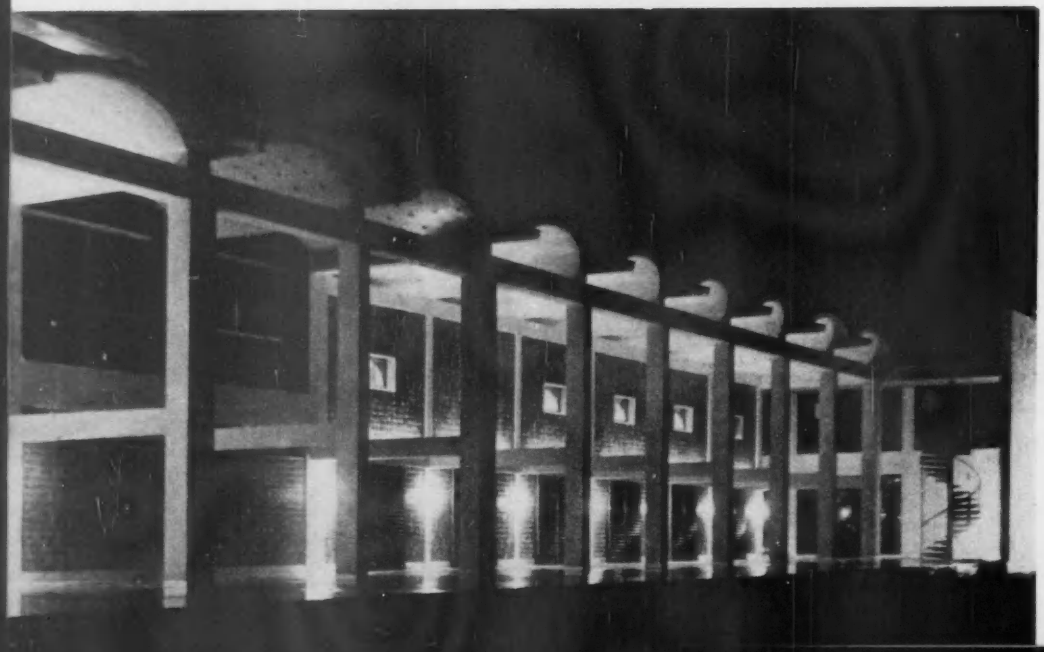
Garden in the family quarters by night. The short mushroom fittings add interest and create a airy-like atmosphere

The road, sweeping from the guard house, around the palace and rising by the walls to the level of the courtyard, appears as a sea of light. The 1 ft high concrete retaining wall incorporates recessed fluorescent lighting in sandproof reflectors designed to concentrate all of the light in a flood across the road. This continuous line of light stretches 450 ft up and around the corner to the main courtyard. Beyond, similar fittings, mounted on brackets and spaced 20 ft apart in the grass verges, illuminate the upper perimeter road.

The courtyard is separated from the perimeter road by a fountain pool and is approached across a bridge at the south east end, a low concrete structure which also serves to support the colour change lighting for the pool and floodlighting for the adjacent courtyard wall. For pool lighting, three rows of nine 80 W fluorescent tubes in pink, blue and green are housed in bronze tube mounts, together with waterproof cathode heating transformers, on the underside of the bridge overlooking the pool. The three-colour electronic automatic dimmer and colour change unit is housed in the pump-room.

On my arrival, this unit was discovered in a rough tarpaulin shed which was by no means sandproof. It was badly damaged, covered with sand and with many broken parts, none of which was obtainable locally. Demanding a completely sandproof corner in true genie style—and getting it—I stripped the unit down, made some repairs and, with a little luck, succeeded in making it work.

On the opposite side of the bridge, nine twin 80 W fluorescent anodised fittings flood the black and white pierced tile wall which separates the courtyard from the women's quarters. The courtyard is paved and pebbled, also in black and white, with recessed tungsten filament lamps sunk below the paving stones at the intersections and a glazed aperture, 2½ in. in diameter, on a level with the paving. The 60 W lamps rely entirely on soil conduction for cooling and 85 of these units are used in the courtyard. The east and



The patio in the guest block. The wall brackets are by Allom Heffer and the blue mosaic domes are illuminated by "Tropical Daylight" fluorescent tubes

The salon, a formal, airy apartment, is illuminated by GEC crystal ceiling and wall units supplemented by fluorescent pelmet lighting

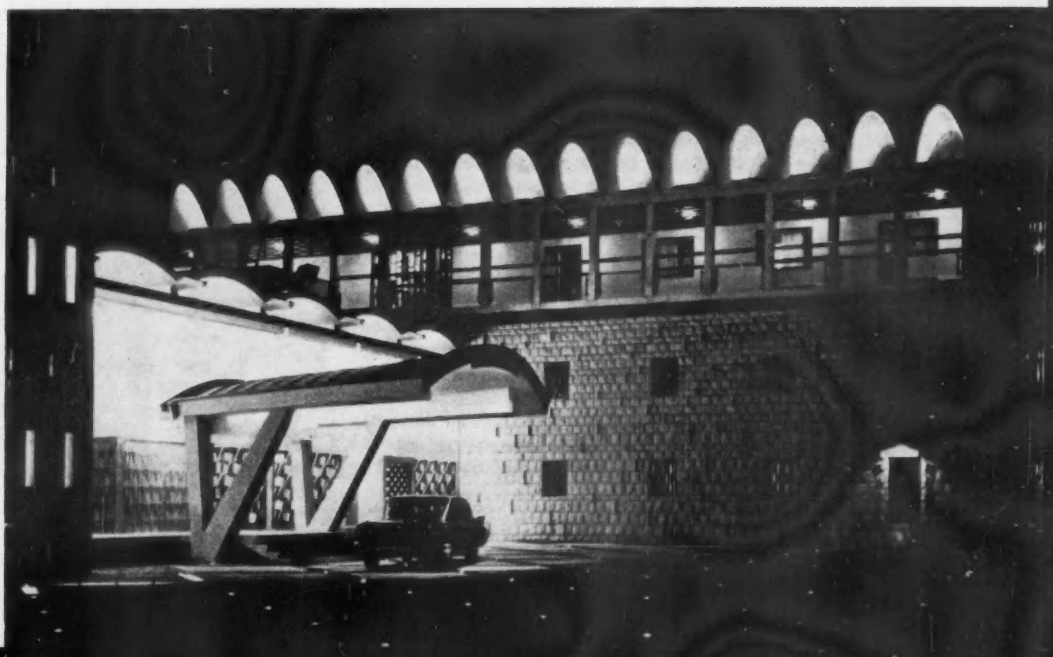
south walls are floodlit from fluorescent tube units, with $1\frac{3}{4}$ in. thick glass covers, sunk level with the paving. Heavy vehicles, including water tankers, pass over both types without harming them.

The main entrance porch, projecting into the courtyard, is faced with gold mosaic, illuminated by concealed 80 W tubes. The adjacent screen wall, in pale green ceramic tiling, is also illuminated by 80 W tubes installed behind the marble facing panel at the top of the wall. Part of this light also illuminates the teak screen and entrance door while, above the porch, a series of vaulted roofs, open at each end and clad on the inner surface with blue mosaic, is also illuminated by concealed fluorescent tubes. To the right and above the personal quarters, other vaulted roofs, open at each end and with gold or yellow mosaic interiors, are illuminated from concealed tungsten filament weatherproof fittings. These roofs also serve to conceal water tanks and the upper surfaces of the roof sections are sheathed with burnished copper.

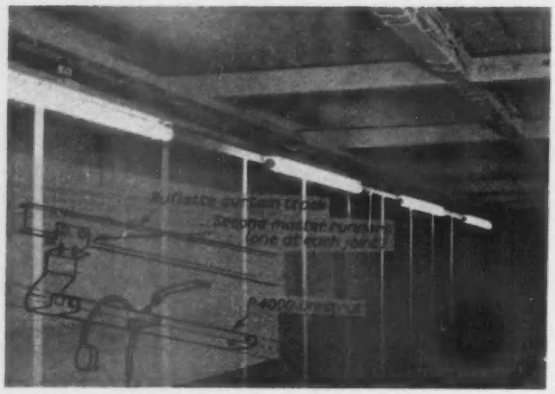
The Interior

Entering the palace, we find before us the entrance to the main salon, where guests and visitors are received. This large, formal room is illuminated by fine crystal electroliers, suspended from the ceiling, and by half units, also of crystal, on the mirror panels in the walls. Both of these are of GEC design and manufacture. The curtained windows are illuminated by concealed tubes in the pelmets, and the centre floor unit also incorporates concealed fluorescent lighting.

To the left of the salon lies the guest wing in which are situated four bedrooms and the sitting-rooms. The latter, on the ground floor, lead out to the patio, pillared and with blue mosaic domes which are illuminated by tubes in sandproof fittings concealed in the upper



The imposing forecourt behind the fountain pool with its pavement lighting. The roof and balcony of the family quarters can be seen above



View above the floating tile ceiling in the dining-room showing the lighting arrangement with, inset, detail of the tube-tray and carriage

beams. Local lighting is from brackets of an unusual design created by Allom Heffer. The wall itself is glazed with pink ceramic tiling which, like all the tiling in the palace, is of Italian manufacture. Lighting in the guest quarters is by local tungsten filament desk lamps with supplementary concealed pelmet lighting.

Returning to the entrance hall, we find on our right the lift which serves the family quarters and, on the ground floor, the ante-room and the dining-room. Lighting for the former is from a George Forrest ceiling unit of unique design. It is in the form of a 13 ft circular ring of black iron suspended on rods a short distance from the ceiling with 20 matt chrome finish brackets and Forrest Modern glassware spaced evenly around the periphery.

Beyond the ante-room lies the dining-room, the lighting of wnich proved the severest test of genieship. This large salon, with pelmeted windows giving on to the lawns, has an unusual roof in the form of a floating ceiling of Italian plaster tiles projecting from one wall and supported from the true ceiling on rods but spaced some 18 in. from the remaining three walls. The tiles are covered with innumerable nodules, the tops of which have been sliced off to give ¼ in. holes through which the light from the ceiling can shine. It was my task to provide the light from above the tile ceiling, which was too fragile to bear any weight.

The problem was solved by suspending a number of curtain tracks from the true ceiling and running out sections of channel, with 80 W tubes strapped to them, on wheeled runners from service hatches at the wall where the false ceiling joined. In all, 40 tubes were installed in addition to a further 42 in banks of three colours located close to the edge. These served to flood the green silk weave curtains covering the white tiled side walls of the room in any one colour to choice. The ballast gear was housed in the room behind the service hatch.

Not so easy was the task of persuading the electricians to install the reflector tubes chosen for this location the right way up. Despite several demonstrations, including the breaking open of a tube to show the opaque reflecting service, they would persist in mounting them upside down. Eventually, in despair, I decided that this was a problem even a genie could not solve and changed them to the ordinary kind. It's the simple things . . . !

The women's veranda, which also contained a swimming pool, is a pillared enclosure with recessed ceiling alcoves paint-sprayed in two tones of grey. In each alcove a single spun bowl of polished copper, pierced above and below in geometrical patterns, enclosed a tungsten filament lamp. The subdued light from the lace-like pattern on the alcove surface provided discreet illumination in the quarters, while small floodlights were used to illuminate the bath. Perforated screens in one wall of the dining-room also permitted the women to view the screen when a cinema show was being given, a projection-room and motorised screen (which would persist in rising without warning until I adjusted its mechanism) being part of the dining-room installation.

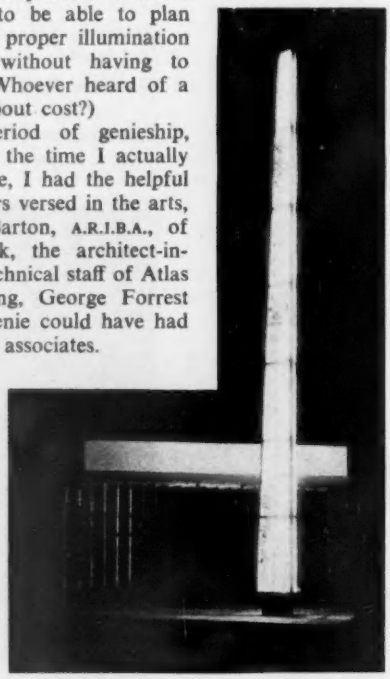
The private rooms of the sheik and his family are all illuminated by tungsten filament lamps in the form of pendants, standards and table lamps, supplemented by fluorescent pelmet lighting. This treatment extends to the two principal bedrooms and sitting-rooms. One of the bedrooms is circular in shape with a domed ceiling coming down to the curtained walls and pelmeted windows. Above the false ceiling, fluorescent tubes are used to shine down on the curtains. In the sitting-room another false ceiling, adjacent to the window area, incorporates a number of tungsten filament spotlights in colour as well as fluorescent lighting, while the gold-faced pelmet is pierced to allow a pattern of light to shine through.

The Gardens

Lighting of the gardens was designed on the spot. The women's garden has, as its main feature, an open circular pavilion with vertical slatted shutters which can be adjusted to any position. For this we conceived a number of suspension fittings in the form of a wide copper tube, closed at the upper end, pierced with a number of Eastern pattern holes and housing a tungsten filament lamp. No such fitting being available, we made up a prototype from copper tubing, borrowed from the palace plumber's workshop. This, after giving us the required lighting, was taken to the local metal-worker who fabricated the finished spun and polished copper lanterns in a matter of hours with all the polish and skill of Eastern craftsmanship. Other features in the garden are marble seats with gold fluorescent tubes mounted underneath and short mushroom fittings dotted about the grounds.

There are, of course, other lighting features which are of conventional pattern, such as the bulkhead fittings which are used in service quarters. It was a pleasant change to be able to plan lighting, both for proper illumination and for effect, without having to count the cost. (Whoever heard of a genie worrying about cost?)

During my period of genieship, when for part of the time I actually lived in the palace, I had the helpful assistance of others versed in the arts, notably Mr J. Barton, A.R.I.B.A., of Farmer and Dark, the architect-in-charge, and the technical staff of Atlas Light and Lighting, George Forrest and others. No genie could have had more co-operative associates.



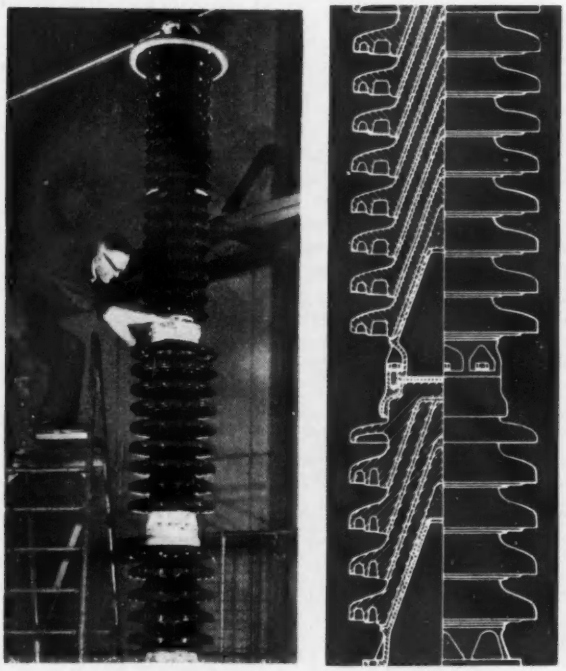
The 30 ft pylon and guard house by night

Post insulator for 380 kV

DESIGN DICTATED BY MECHANICAL RIGIDITY REQUIREMENTS

CURRENT plans to uprate the British Super Grid from 275 kV to 380 kV has been one of the reasons for the introduction by Doultons Industrial Porcelains Ltd. of their Multicone post insulator. In the design of post insulators the two complementary factors of height and rigidity become increasingly significant at higher system voltages. A certain minimum rigidity is essential for isolator-switch applications. Height reduction in itself increases rigidity, at the same time it decreases windage and is also important in possible situations demanding installation indoors. Until now, the type of post insulator commonly used in this country has been the cap and pin multi-unit pedestal. But even for 275 kV, this is over 10 ft high and it only just fulfils specified requirements for maximum cantilever deflection. Thus, for 380 kV working and above the pedestal design is not really suitable.

On the Continent, the problem has been solved for some years now by the successful use of post insulators built up from conical elements. Doultons, in collaboration with Messrs Merlin-Gerin, of Grenoble, have, in fact, adapted this design for the Multicone insulator.



Doulton 380 kV Multicone post insulator. Construction, shown on right, reduces height and gives much greater rigidity than corresponding pedestal type

Construction

The method of construction employs conical porcelain elements, each integral with a shed, which are stacked one upon the other and cemented together to form a solid section of insulator pillar or post. The British version differs from the French in that anti-fog instead of plain sheds are employed and the unit has a greater mean diameter. This allows for the more stringent requirements of British Standards in respect of total leakage path and mechanical strength. For convenience in handling, the Doulton 380 kV unit is broken up into three sections which are separated by bolted galvanised iron flanges. The top section is longest and has also reduced diameter sheds; this gives optimum electrical stress configuration. Overall height of the post reaches only 11 ft 8½ in.

It is the effectively "solid porcelain" construction of the Multicone post insulator, having only two metal elements, which gave it rigidity and compactness. By comparison, a 275 kV pedestal type has as many as 14 relatively flexible metal components which result in a deflection, under the cantilever working load, of more than three times that of the Multicone equivalent.

Electrical Characteristics

The new design possesses certain other merits, both from electrical and manufacturing standpoints. Thus, its relatively uninterrupted surface profile makes for uniformity of electric field, resulting in higher flashover values than for the conventional design. Furthermore, breakdown is not limited by puncture strength of the porcelain body, which is much greater than that of the surface flashover value. This is one drawback of the hollow cylindrical type of insulator, where there is the possibility of the ingress of moisture onto the inner wall, promoting conditions for puncture to take place.

Another advantage of uninterrupted profile is that a maximum number of sheds can be accommodated for a given maximum height for impulse flashover. Leakage path provided is in the region of 1 in./kV. Finally, with the pillar design adopted for the 380 kV unit, a satisfactory corona level of 280 kV can be maintained using a stress grading ring of only 22 in. diameter. This helps to reduce spacing of units in substation layout necessary to comply with specified electrical clearances.

Ease of Manufacture

Manufacture of Multicone conical elements is considerably eased by their manageable size. They lend themselves during initial formation from wet clay to the much-favoured "jolleying" process. They are also suitable for firing in a tunnel kiln, where it is possible to maintain closely controlled conditions. In addition, the design affords a good deal of flexibility in the making-up of complete post insulators. Thus, a variety of specified voltage ratings can be catered for simply by adding or subtracting an appropriate number of conical elements.

Block heaters in schools

TESTS SHOW THEY COMPETE WITH HOT-WATER RADIATORS

IT costs no more to heat a school by electric thermal storage block heaters than by a hot-water radiator system. That is the conclusion from tests carried out to check a Ministry of Education ruling that off-peak electric heating did not lend itself to economic use in schools. When that opinion was promulgated, the supply industry arranged with the Ministry for comparative tests to be carried out on pairs of similar schools in different parts of England. One school of each pair was heated by a normal hot-water radiator system, the other by thermal storage block heaters. The tests are described and the results discussed in a report published by the Electricity Council.*

The table shows the characteristics of the schools selected and the heating systems involved in the test. All the schools are relatively old, erected at the turn of the century, and each pair are of relatively similar construction. However, the calculated heat losses are far from being identical, a point to be borne in mind when comparing costs.

In the tests, continuous temperature records were obtained by placing thermographs in a few rooms judged to be representative of the whole building. Electrical heating was on a basis of a maximum charging period of nine hours a day, with omission of the Friday/Saturday night period.

* Utilisation Research Report No. 16: Comparative tests on heating school buildings by electric thermal storage block heaters and other methods. Available from Information Officer, Electricity Council, Trafalgar Buildings, 1 Charing Cross, London S.W.1.

On average, all the systems installed maintained the Ministry requirement of a minimum temperature of 62°F. During the coldest week all systems failed to maintain this temperature, but the report suggests that performance of block heaters was generally better than that of hot-water systems. On the whole, early morning temperatures were higher with block storage heaters, while the 4 p.m. temperatures were about the same for both systems.

An inquiry was made to obtain teachers' assessments of comfort conditions in the instrumented classrooms. Opinions varied somewhat as to which of the systems was the more "comfortable," as distinct from too warm or too cold, but the balance of preference was with the electrical systems.

One of the indications of the tests has been that so far as block storage heaters are concerned, considerable economy can be achieved by choosing a suitable control system and ensuring that it operates satisfactorily. The tests suggest that average consumption for a school heated by block heaters is about 26,000 kWh/therm of calculated heat loss/year; 900 kWh/kW. Solid fuel consumption corrected to the same degree days basis and design temperature is 7·3 tons coke/therm of calculated heat loss/year. For oil, 1,190 gal/therm/year.

Cost figures shown in the table are based on 25-year depreciation, reckoned generous for solid-fuel installations and conservative for electrical installations; and on 5% interest on capital. Total annual cost per therm of calculated heat loss ranged from £108 to £177 for electrical systems, and from £110 to £172 for coke. For the oil-fired school it was £213.

CONSTRUCTIONAL, INSTALLATION AND COST DATA

Location of Schools	Heating	Method of Control	Design Internal Temperature	Calculated Heat Loss		Building Construction: Walls (all solid)	Building Construction: Roof	Building Construction: Floor	Floor Area	Installed Heating Load (Electric)	Capital Cost	Total Annual Cost
			°F	therms	kW	in.			sq ft	kW	£	£
Manchester	Block heaters	Maclaren regulator and room thermostats	60-65	1·12	32·5	14	Slate roof with plaster-board ceiling and 1 in. fibreglass insulation	Timber on joists	3,120	39	880	177
	Coke-fired	Room thermostats and time-switch for night period	62	1·6		14	Slate-roof with plaster-board ceiling and 1 in. fibreglass insulation	Timber on joists	3,050		1,145	275
Kingston-upon-Hull	Block heaters	Maclaren regulator	62	9·74	285	13	Slate-roof with plastered ceilings	Timber on joists	12,800	331	7,560	1,535
	Coke-fired	Banked fires from Saturday morning until Monday morning	62	8·78		18	Slate-roof with plastered ceilings	Timber on joists	13,800		5,250	1,147
Leicestershire	Block heaters	Internal and external thermostats (QA/QR)	62	1·06	31	14 and 19	Slate roof with lath and plastered linings and suspended ceilings	Timber on joists	1,570	31	555	146
	Coke-fired	Fires drawn on Friday night, relit Sundays	62	1·5		18	Slate roof with lath and plastered lining	Timber on joists	1,645		665	165
Birmingham	Block heaters	Internal and external thermostats (QA/QR)	62	2·28	67	13½	Tiles on battens with lath and plastered lining	Wood-block on concrete	4,300	86	1,335	248
	Oil-fired	Night shut-off	62	2·86		13½	Tiles on battens with lath and plastered lining	Wood-block on concrete	4,720		3,590	609

Marine self-regulating alternators

by J. Griffin, A.M.I.E.E.

PART 1

IN an earlier article[1] on the general subject of marine alternator practice, it was noted that the special circumstances obtaining aboard ship had created a demand for an alternator with superior transient voltage response characteristics. The article went on to consider briefly the consequent entry into the marine field of the so-called "self-regulating" alternator, in which the inherent transient characteristics of the alternator are modified by some form of load-current compounding. It was mentioned also that in most of the available machines a static excitation system is substituted for the conventional rotating exciter; advantages in respect of inherent reliability, reduced maintenance and layout flexibility naturally follow.

It is proposed in this article to examine briefly four of the self-regulating marine alternators currently available. Of these, three are of British origin and have been developed in their present form only recently; the fourth is representative of a number of Continental machines generally similar in principle (though often differing widely in detail), some of which have been available for some time.[2]

The Problem

Ever since the original development of the synchronous alternator, attempts have been made to solve the problem of inherent voltage regulation. Many of the attempted solutions have been extremely ingenious, and some certainly pointed the way to the more or less successful systems of today; most of them, however, failed because of the inferior characteristics of the devices then available for the rectification of alternating current. It was not until the advent of the relatively modern selenium rectifier that even moderate success was achieved. Development was in any case retarded by the outstanding success of the various forms of electro-mechanical a.v.r., and until very recently even the more successful of the self-regulating alternators found application only in the smaller sizes where the cost of the conventional a.v.r. was disproportionately high, or where the inherent reliability of a completely static system was particularly valuable. It is probable, indeed, that had it not been for the introduction of a.c. into marine practice, the extension into the larger-output fields of some of the now commercially successful self-regulating alternators would have been considerably delayed, since it was really not until the special advantages for marine purposes of the superior transient voltage response performance of these compounded alternators became apparent that such machines were elevated from relative obscurity to their present prominence.

To the marine electrical engineer, used long since to the efficient simplicity of the level-compound d.c. generator, it may be rather surprising that so much difficulty has been experienced over this problem of alternator voltage regulation. There are, however, some significant and not entirely obvious differences between the d.c. and the a.c generator in this respect; in spite of the fact that the relative proportions of the armature and field m.m.f.'s in the two types of machine are of the same order, the a.c. machine presents a much more difficult voltage regulation problem. Before considering the few selected solutions, therefore, the nature of the problem will be briefly examined.

In an ordinary d.c. generator the field winding has merely to provide sufficient magnetising m.m.f. on the direct or polar axis to maintain the required main flux; the inherent voltage regulation with load is due to the relatively small internal resistance drop in the armature circuit, and to the net on-load flux reduction occasioned by the magnetic saturation in pole-tip and armature teeth on that side of the pole whose resultant m.m.f. is strengthened by the distorting armature reaction m.m.f. In an alternator, however, the absence of the commutator and fixed brushgear permits the load current or armature reaction m.m.f. (which in the d.c. machine is confined effectively to the quadrature or interpolar axis, and is thus prevented from greatly affecting the main flux) to interfere with the field m.m.f. much more directly. The effect of the armature reaction m.m.f. varies not only with load but also with load power factor; least at unity p.f., it is greatest at zero p.f. lagging, in which condition the armature m.m.f. is in direct and demagnetising opposition to the field m.m.f. Thus in an alternator the field winding has no longer merely to provide the magnetising m.m.f.; instead it must maintain the magnetising m.m.f. against the reaction of the armature m.m.f. In practice, the resultant field m.m.f. at full-load may be more than twice the purely magnetising m.m.f.[3]

The on-load effect of the armature leakage reactance drop (which normally increases the internal e.m.f. necessary for a given terminal voltage, and hence requires corresponding increases in main flux and magnetising m.m.f. with increasing load) also varies with power factor, being again least at unity p.f. and greatest at zero p.f. lagging. (Although only a second-order effect, since in a normal alternator the on-load flux increase required may be of only 5 to 15%, this phenomenon cannot be ignored.)

The separate effects of armature reaction and leakage reactance (often idealised into a single effect termed *synchronous reactance*) combine to increase considerably the total excitation required for the maintenance of a

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[1] Griffin, J.: "Shipboard A.C. Generators," ELECTRICAL TIMES, 26 May, 1960, Vol. 137, pp. 837-842. Mr Griffin is with W. H. Allen, Sons and Co. Ltd.

[2] It will be appreciated that the examination of all or even most of the available systems would be quite impossible in a short article. The above choice has been made in order to cover with reasonable adequacy the machines most likely to be of interest to the British marine electrical engineer.

[3] By way of comparison it may be noted that in a similar d.c. generator the corresponding ratio might be only about 1·10 or 1·20.

constant terminal voltage in a loaded alternator. Fig. 1 illustrates graphically the very wide steady-state[4] excitation range required by a typical marine turbo-alternator, and it is clear that any attempt to provide the necessary excitation range inherently (i.e., in a purely passive or functional manner, rather than in response to an error-actuated automatic control system such as an a.v.r.) must perforce take proper account of the power factor of the load current as well as of its magnitude.

Compounding

Load-current compounding along the lines of the well-known d.c. compound generator is one fairly obvious approach to the alternator voltage regulation problem. In the usual rotating-field alternator the provision of a separate series winding and an additional slip-ring may be structurally inconvenient, although by comparison with the d.c. machine any difficulty is probably more than counter-balanced by the ease with which the actual load current can be reduced to a more convenient value (by means of the in-any-case-essential series transformer) before being fed to the series field winding via a rectifier. Simple compounding of this type is in fact the basis of one of the successful systems to be considered, but in principle at least this method cannot by itself provide the complete answer; although responsive to the magnitude of the load current such a system is inherently insensitive to power factor.

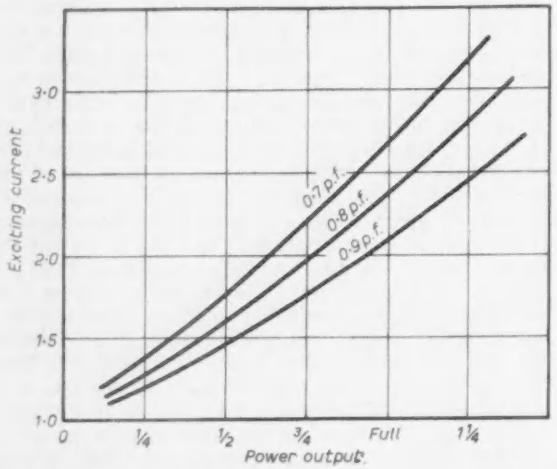


Fig. 1. Typical marine turbo-alternator excitation characteristics

Phase Compensation

All the machines to be described are load-current compounded, so that in every case the total alternator excitation contains a "series" component directly proportional to the output current. In three out of the four systems considered, the compounding is, in addition, "phase-compensated" and since the method adopted usually entails the virtual duplication, in a static excitation system, of the basic m.m.f. relationships obtaining in the alternator itself, these relationships must first be briefly examined.

To a first approximation the field m.m.f. required by an alternator can be established by means of a simple space-vector m.m.f. diagram of the kind shown in Fig. 2. In this diagram, the vector F_m represents the m.m.f. required to maintain the no-load flux Φ; the vector F_a (drawn parallel to the time-vector I representing the output current, and thus lagging by the appropriate phase angle φ on the output voltage vector V) represents the "synchronous reactance" m.m.f., which in an idealised unsaturated and distributed-field machine with a uniform air-gap combines accurately the effects of the true armature reaction m.m.f. and the leakage reactance drop. Finally the vector F_r represents the total or resultant field winding m.m.f. necessary to maintain F_m against the reaction of F_a. (The diagram shown has been drawn for a constant power output at various power factors, and it is interesting to compare the various full-load/no-load excitation ratios given by this simple diagram with the data from Fig. 1.)

The methods actually used to duplicate the alternator m.m.f. diagram in the excitation and control equipment naturally vary considerably in detail, but nearly all of them rely on the vector combination (on the a.c. side of a main field rectifier) of excitation components corresponding approximately to the magnetising and synchronous reactance vectors F_m and F_a of the alternator m.m.f. diagram. A "shunt" component (obtained from a circuit connected across the output terminals and thus providing an approximately constant contribution corresponding to F_m) is combined vectorially with a "series" component

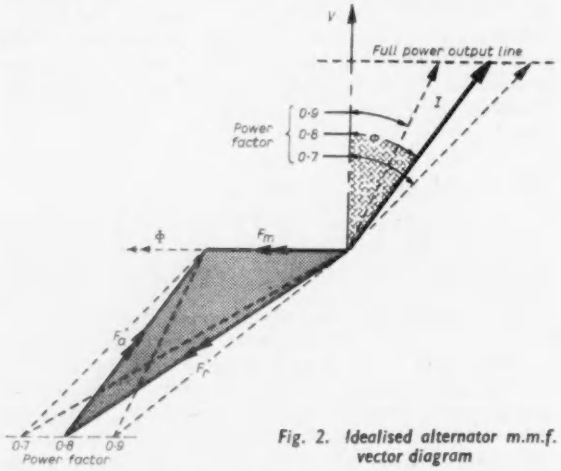


Fig. 2. Idealised alternator m.m.f. vector diagram

(almost invariably obtained from a series transformer and thus variable in both magnitude and phase and corresponding to F_a) in such a sense as to provide inherently a total excitation characteristic at least approximating to that required by the alternator.[5]

The essentially a.c. problem of combining the separate excitation components vectorially lends itself very readily to the use of such static circuit elements as transformers, reactors, and capacitors, and static rectifiers are of course the obvious choice for converting the a.c. output of the excitation system into the direct current required for the field winding. Most of the successful systems consist

[4] Considerable margins respectively below and above the no-load and full-load requirements are essential for the successful operation of any form of regulating system; in practice, therefore, the overall excitation ranges necessary may be more than twice those shown in Fig. 1.

[5] It should be noted that such a system is inherently a purely "functional" one, in that no attempt is made to detect departures from a set output standard and to initiate positive corrective action. Once set to give a particular and inherent output/input characteristic a functional system is unable to compensate for departures from the original design conditions (such as, for example, a change in the load/speed characteristic of the prime mover).

primarily of combinations of these static components, and users generally seem to have accepted gratefully the increase in inherent reliability and the reduction in maintenance which arise from the substitution of a static system for the usual rotating d.c. exciter with its inevitable commutator and brushgear.

Whole or partial self-excitation, i.e., the provision from the alternator output of the required excitation power, is also almost universal, notwithstanding the difficulties associated with excitation initiation and the inconvenience of suffering a shunt excitation component reduction on the occurrence of a transient voltage drop. Various circuit refinements may be introduced to compensate for departures from the ideal in both alternator and excitation system; variables requiring this sort of compensation include in particular the increase with temperature of the resistance of the alternator field winding, and the effects of magnetic saturation.

The L.S.E. "Altoreg"

This particular system is unique in that, although it employs the presently popular technique of load-current compounding, it nevertheless makes no attempt at phase compensation. The compounding effect of the "series" component of the total excitation is dependent only on the magnitude of the load current, no account being taken of the power factor; the additional control needed to maintain a constant terminal voltage is exercised by an a.v.r. in an exciter-fed "shunt" circuit.

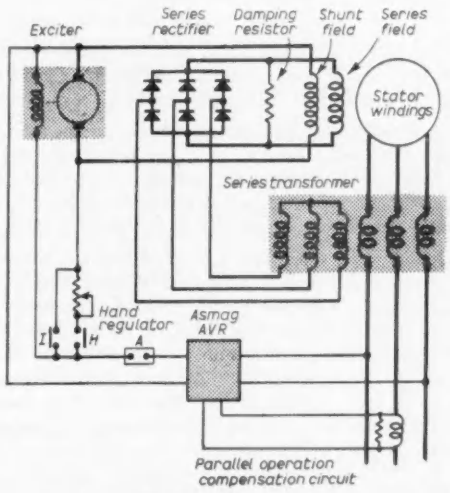


Fig. 3. L.S.E. "Altoreg" alternator system

The basic excitation and control circuit schematic is shown in Fig. 3. The alternator is provided with two separate field windings; of these, one, the "shunt" winding, is fed from the armature of a normal d.c. exciter, while the second, or "series" winding, carries the rectified output of a three-phase series transformer connected in the alternator output lines. The field winding of the exciter may, as in Fig. 3, be separately excited from the alternator output terminals through a static magnetic amplifier type a.v.r.; alternatively, self-excitation may be employed, the exciter field being shunted across the armature and controlled by any conventional a.v.r. The former combination, that of a basic "Altoreg" alternator with an "Asmag" static a.v.r., has been designated the "Altomag," and as this is the type most likely to be met with in normal marine practice no further attention will be paid here to the several other variants of this interesting machine.

In the absence of any inherent phase compensation, a design choice has to be made about the relative values of the shunt and series excitation components, and these are normally so chosen that an approximately level voltage/load characteristic is obtained at the rated power factor. The effects of load power factor (and of changes in speed or winding temperature) are compensated automatically by changes in the shunt component, i.e., by the output of the exciter acting under the continuous control of the a.v.r.

Parallel operation is normally provided for either by the usual quadrature-droop compensation or by a variant known as differential quadrature compensation.[6] A further refinement, useful when identical machines are to be operated in parallel, consists of the direct paralleling of their series field windings by means of "equaliser" connections; dissimilar machines can also be "cross-compounded" if required, although some additional complication may be entailed.

To cater for the possibility of an a.v.r. failure and also as a convenience for testing and commissioning purposes, an "Auto/Hand" change-over switch enables the exciter field to be connected across the exciter armature via a regulator, thus converting the exciter from separate to self-excitation; an additional feedback from the alternator output to a separate bias winding on the exciter may be necessary, however, to ensure exciter stability in the self-excited condition. Initial excitation is simply obtained by

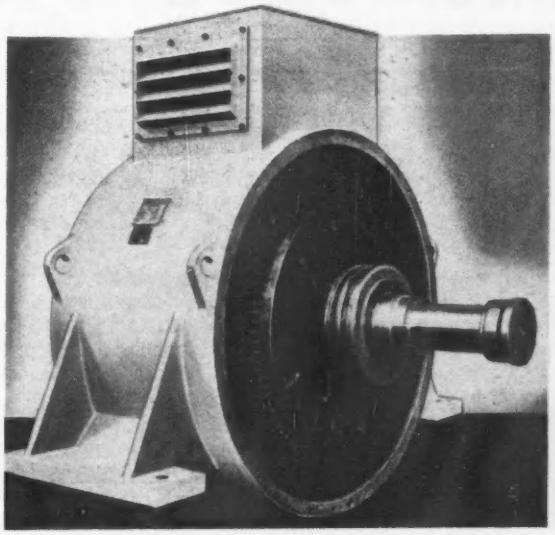


Fig. 4. 500 kVA, 750 r.p.m. distributed-field "Altoreg" alternator, with integral ventilated housing for series transformer and rectifier

means of a voltage-controlled relay which connects the exciter field temporarily across the exciter armature through a pre-set resistor; when sufficient alternator terminal voltage has been established, the relay operates to restore the normal feed to the exciter field from the a.v.r.

Three slip-rings are necessary because of the two separate field windings, but apart from this the alternator itself closely resembles a conventional machine in appearance, although the exciter can be rather smaller than

[6] The latter method also uses a current-transformer-fed resistor in the a.v.r. voltage signal feed, but inter-connections between the resistors of the paralleled machines ensure correction only in the event of actual unbalance, and the normal level voltage/load characteristic is thus preserved unaffected.

usual because it is responsible for only part of the total excitation. Internally, however, the alternator may be rather different from the conventional salient-pole machine, since when the best possible transient voltage performance is required (and especially with very large machines), a distributed-field construction is sometimes adopted. Whenever possible, the series transformer and rectifier are accommodated on the alternator itself; by arranging for them to be cooled by the alternator ventilating air their size and cost can be reduced. The only external components then requiring accommodation on the main switchboard are the a.v.r. and the usual regulators, the change-over switch, the parallel operation compensation components, and the excitation initiation relay.

The load-current compounding principle employed provides an eminently satisfactory transient voltage response performance. In general, the policy of the manufacturer concerned is to design the system as a whole for a transient voltage regulation of about 15% with a low-power-factor impact load of 100%, the recovery time[7] for ordinary applications being normally between one-half and one second. It would at first sight appear that a phase-compensated system might perhaps be inherently better able to cope with the inevitably low-power-factor motor starting loads, but the relative independence of the "Altoreg" exciter-fed "shunt" circuit and the design of the series transformer seem in practice to promote a performance equal to that of any comparable British system.

(Part 2 of this article will describe the W. H. Allen self-regulating alternator, the GEC "Accurex" system and the Siemens "Constant Voltage" alternator.)

[7] The "recovery time" may best be defined (albeit rather loosely) as the time taken, from the instant of application of an impact load, for the voltage to recover to within, say, $-2\frac{1}{2}\%$ of normal. With most systems incorporating error-actuated control devices there will normally be at least one significant voltage overshoot before final stability is attained, and a typical response oscillogram appeared as Fig. 3 of the earlier article already mentioned.

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

Motor Control Gear

IN his interesting article in the 24 November issue, Mr R. A. F. Craven makes clear the advantages of using direct-on-line started squirrel cage motors, particularly the smooth acceleration of the drive due to the absence of transitional peak change-over currents.

When, however, supply limitations make necessary some reduced voltage method of starting there is an alternative to the auto-transformer pattern operating on a 75% tap; and that is the *series* delta starter. This gives approximately the same starting performance (namely, about half the values obtainable with d.o.l. starting).

With this method, standard delta-wound motors are used, but the phase windings need to be centre-tapped. In compensation for this feature the starter has the simplicity, robustness and reasonable cost of the star-delta pattern; and yet makes possible a higher starting torque than is available from that pattern.

Perhaps this alternative might prove an attractive solution for marine applications.

A. N. D. Kerr, A.M.I.E.E.,
BRISTOL.

Distribution System Protection

I WAS very interested in the article by Mr G. Hall (24 November) giving details of a serious effort at simplifying the protection of transformers, with the attendant reductions in circuit-breakers needed.

One disadvantage of this scheme, which was mentioned, is that magnetising inrush currents can operate the low-set protection and it is therefore necessary for a link to be removed before energising a feeder. There is the attendant risk of forgetting about this link either before or after the switching. If the low-set element was self-resetting and if the time delay was increased slightly, the protection would not respond to inrush currents and hence no withdrawal of trip links would be necessary.

The increase in time delay would mean that a low voltage fault not covered by fuses would persist longer than 0·4 sec as under the scheme mentioned. I take refuge behind the fact that such faults have a low frequency comparable to that of transformer faults.

E. G. Hopper, A.M.I.E.E.,
THURSO,
CAITHNESS.

* * *

THE low-set flag indicators mentioned by Mr Hopper have indeed operated when re-energising a network after shut-down, due to magnetising current inrush. This condition is only transient, however, and no danger of tripping exists. Mr Hopper's criticism is, therefore, not valid, and his proposals to increase the time delay are completely unnecessary.

G. Hall, A.M.I.E.E.,
LEEDS, 17.

Piezo-electric Ignition.—Use of a piezo-electric device to give the ignition spark for an internal combustion engine is demonstrated on the Trojan stand at the Smithfield Show. The unit occupies $3\frac{1}{2}$ cu in. and weighs only $\frac{1}{4}$ lb. The material used is a lead-zirconate-carbonate piezo-electric ceramic made by the US Clevite Corporation, whose British associates are Brush Crystal Co. of Southampton. The whole device has been called a "spark pump" and has two ceramic rods about $\frac{1}{4}$ in. long with a small gap between them, in a plastics container. The rods are squeezed by a simple mechanism linked with the engine, and produce a voltage of about 20 kV. An important advantage of the device is that it produces a constant high voltage at all engine speeds.

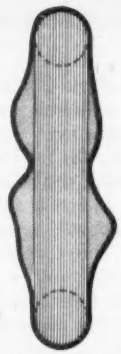


Fig. 1

Transformer developments

NOISE INQUIRY AND NEW CORE CUTTING PLANT

TRANSFORMER cores, it seems, are not the rigid structures they at first sight appear to be. In fact, they pulsate rather like well-fed boa constrictors. A striking impression of the complex vibrations produced in a core by an alternating magnetic field is conveyed by an animated colour film prepared by Ferranti research engineers.

The film shows how single- and three-phase transformer cores would appear if their amplitude of vibration was multiplied 30,000 times. It is based upon accelerometer measurements made during investigations into the causes of transformer noise. Increasingly, transformers are located in built-up areas where noise can be objectionable.

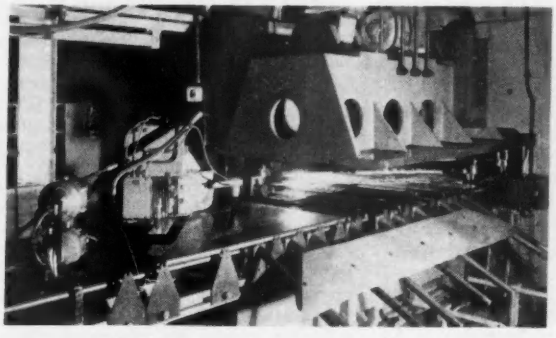
Source of Noise

Investigations into noise show that it is caused by complex longitudinal and transverse vibrations of core laminations. The longitudinal vibrations are caused by the well-known magnetostrictive effect, but the transverse vibrations are the result of interaction between the effects of magnetostriction, variations in core material permeability and design factors which result in flux transfer from plate to plate.

The transformer designer has little control over these factors, although he can, to some extent, limit flux transfer between laminations. Prevention of noise generation requires much more fundamental knowledge of the behaviour of core steels and development of techniques for producing homogeneous materials. This is not likely to be achieved for some years. The designer must, therefore, resort to palliatives. For example, noise emission can be attenuated by up to 35 dB with a suitable steel enclosure for the transformer, and in some cases anti-vibration mountings can be used with success.

Backbone Core

Another approach to the problem of noise limitation has been attempted by Ferranti with their backbone core. The investigations suggested that the nodal points of the vibrations producing noise are roughly in the centre of the core limbs. If the core was suspended at these nodes, transmission of vibration to the tank would be substantially reduced. The backbone core consists of a central vertical steel member with brackets at the nodal points. The core laminations are slotted and hung from these brackets and stiffener plates are then placed over the leg length. To reduce flux distortion, bolt holes are omitted from the core and it is held together by a number of steel bands encompassing both the limbs and yokes. During core assembly, the laminations are compressed hydraulically and the steel bands tightened to clamp the core and yokes firmly. Insulated inserts in each band prevent them acting as shorted turns. The construction also has mitred laminations to reduce cross flux. Although both iron loss and magnetising VA are reduced by this construction, the reduction in noise emission has been found to be disappointing, probably because the nodal points are not at all well defined.



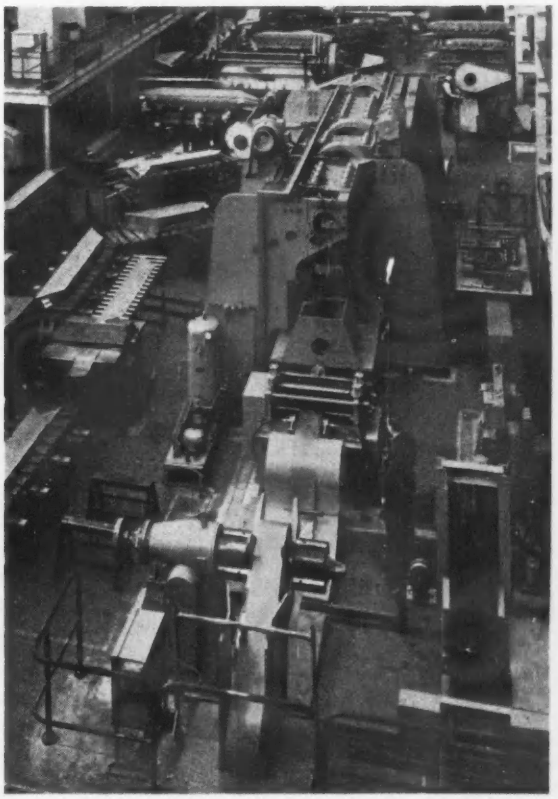


Fig. 1 (page top), Relative values of longitudinal and transverse core lamination vibrations, with the vibration amplitude greatly magnified. A "still" from the Ferranti film, "Vibrations in Transformer Cores"
Fig. 2. A core plate being ejected from the front of the core press

Fig. 3. This Ferranti core press can punch two plates 15 ft long simultaneously. Holes are punched with great accuracy with reference to the centre line reference on each plate

During their research programme, Ferranti also investigated the use of a hard resin bonder of the Araldite family. It was found that, with the same core, noise actually increased after bonding. It was also found that increasing core compression does not necessarily reduce noise emission, although there did seem to be an optimum pressure to give best results.

Long-term improvements depend on better understanding of steel characteristics and obtaining more consistent values for magnetostriction, permeability and thickness—a nominal 0·014 in. thick sheet may vary between 0·011 in. and 0·018 in. In the short term, Ferranti have two investigations in hand, the building of two cores, one with very small magnetostriction and the other with uniform magnetostriction.

Although much remains to be done, it is comforting to learn that cold rolled steel probably does not behave any worse than hot rolled steel under the same magnetic conditions and also that no great economies in construction can be expected, even if ways of reducing the noise nuisance are found.

Automatic Core Press

While work continues on the theoretical problems of noise generation, the practical problem of producing large laminations from grain-oriented steel has been solved by installing a press with several unusual features. The press was developed by Ferranti and has been in operation since July. It can produce two core plates simultaneously with a maximum size of 15 ft by 47 in. at rates varying from 360 plates/hr to 480 plates/hr. To reduce inaccuracies, holes and slots are punched with reference to the centre line of the plates rather than one edge, and special features have been incorporated to give a punching accuracy to within 1/10,000 in.

Coils of cold rolled steel are first cut to the correct plate width on a rotary slitter. The roll is mounted on a motor-driven mandrell A (Fig. 4) and fed into the storage loop between B and D. The motor is controlled by photo-electric cell and light beam C, C′ to maintain sufficient material in the loop for a single press operation. Material is fed into the press by one group of the rolls D. The first operation, under hand control, is to mitre the sheet end with tool E_1 and, at the same time, to punch a series of holes with the tools F_1. When this operation is completed, the press is set to automatic control. The feed rolls D then feed the sheet forward at 200 ft/min until it interrupts a photo-electric cell at G, G′. The sheet speed then reduces to ½ ft/min. At H, the sheet strikes an accurately positioned micro-switch.

The feed rolls stop and a small punch is driven through the sheet at H and remains in position. A second set of rolls at D now runs in the reverse direction, tensioning the sheet against the punch and removing any ripples in the material. These rolls include an electro-magnetic slipping clutch. When the clutch begins to slip, a clamping device at D holds the sheet in tension and the press descends, punching simultaneously two core plates. The plates are ejected to the front and back of the press and the cycle is then repeated. The press also has provision for deburring the sides of the sheet.

All core plates are stacked automatically to have their punching burrs on one side. These are subsequently removed by a rotary grinder. The plates are then annealed in a nitrogen atmosphere furnace at 800°C and finally sprayed on one side with a kaolin coating which is subsequently baked.

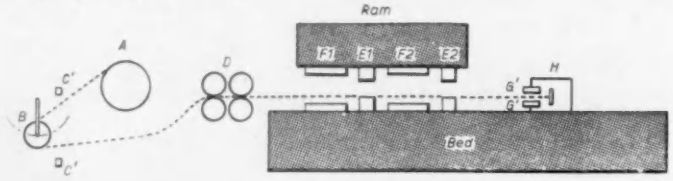


Fig. 4. Diagram of the core cutting machine. A, Unwind coil; B, Jockey roll; C, C′, Photo-electric cell; D, Feed and reverse tension rolls; E, Mitre cutting tools; F, Punches; G, G′, Photo-electric cell; H, Travel limit micro-switch

Corrosion in oil-fired boilers

THE results of trials made at Bromborough power station to find ways of suppressing acid deposits from power station flue gases are described in a paper presented to the Institute of Fuel yesterday.*

Burning residual fuel in power stations causes three principal difficulties: blockage of the air heater, corrosion of the air heater, ducts and dust-collecting plant and emission of acid-laden smuts from the stack.

Comparative trials of solid additives were made at the station and additional trials were made at Ince. Both stations burn residual fuel oil with between 2·9% and 3·4% sulphur content. The amount of sulphuric acid in the flue gas was greatly reduced by three additives: magnesium carbonate, a proprietary material, and zinc dust. Of these three, magnesium carbonate was the cheapest, costing 8d/ton of fuel. the proprietary additive, 10d/ton, caused greatest fouling of the air heater, and zinc dust, 1s 7d/ton, fouled the burner air ports and interfered with combustion.

Experiments with both dual firing using a coal to oil ratio of 1:10 and also of pulverised fuel-ash injection caused severe fouling of the air heater by ash and sulphuric acid. The burners at Bromborough are of the steam atomising type while those at Ince are pressure atomised. Comparative tests showed no significant difference in the quantities of sulphur trioxide produced by these two types of burner.

The corrosion is caused by acid condensing on to cool surfaces. It would be possible to overcome the difficulty by increasing the temperature of the flue gases above the dewpoint or by reducing the sulphur trioxide content to a harmless level. The first method could result in a loss of thermal efficiency of as much as 1% and, in addition, would probably increase acid emission from the stack.

The paper recommends that all oil-fired boilers should be operated with the minimum practicable amount of excess air to suppress the formation of sulphur trioxide. It also suggests future work on magnesium carbonate and zinc as additives, but says that more reliable methods of feeding into the furnace than that used in the trials are required.

The type of corrosion probe used during the trials gave very realistic data on the rate of corrosion of air heater surfaces and the measurement of air heater metal temperatures over the coolest region gave valuable information on gas-side fouling.

It was found during the trials that sulphur trioxide concentration was markedly dependent on excess air in the flue gas and that, contrary to previous published results, the percentage oxidation appeared to increase with sulphur content. No significant correlation between sulphur trioxide concentration and electrical dewpoint was found.

* "Acid Deposition in Oil-fired Boilers: Comparative Trials of Additives and Testing Techniques," by P. A. Alexander, R. S. Fielder, P. J. Jackson, E. Raask (all CERL) and T. B. Williams (CEGB).

AROUND THE TRADE

BY PEREGRIN

WITH Christmas only a fortnight away the pace quickens, the shop swarms with people, the gift type articles run out of stock, the phone buzzes steadily, there are too many jobs chasing too few workmen, and in spite of the gloom, the rain and the credit squeeze, the month is off to a good start. November has shown good results for the smaller articles: the deposit money for the new washing machine or refrigerator has been diverted to buy a new kettle or a fitting for the dining-room until finances become more steady. Refrigerators are not selling, but I am glad to see that Tricity have broken away from conventional design with their new refrigerator, the Diner-cold—it is such a refreshing change from the cold, clincal white enamel. I never could understand why it was so essential to match the refrigerator to the lavatory basin rather than the furniture.

Washing Machine Sales

The Bendix and the English Electric Liberator appear to be the only washing machine selling at all. Hoover, Servis and Parnall seem very dull in spite of their obvious merits. I think Servis could do with altering their design a little; public taste now seems to be for plain, clean lines rather than the flamboyant. Their Super-Twin is a definite improvement in this direction. Hoover's are spending a lot of money on very beautiful advertisements, but I wonder whether a glossy coloured picture of a couple of giraffes really sells anything to the type of housewife who does her own washing? A glossy coloured picture of a modern kitchen with a washing machine *in situ* would do far more for all of us. But I would like to compliment them on their attractive display in their Regent Street shop. I notice it makes heads turn even on the bus—I wish I could say the same about the untidy outline and rooftop of their Perivale factory, as seen from the railway. Surely they could transfer some of their twopence coloured ideas to make it more attractive.

I appreciated the straightforward statement from English Electric regarding their future sales policy and their method of dealing with price reduction—this last a most important point to dealers—but I am not so pleased with the new Bendix policy. Bendix have now joined the direct-to-dealer group and are proposing to reduce their discount to 22½% and to take over all service. Apart from the reduction in discount, the dealer who prides himself on good customer relations prefers to keep the service in his own hands—the under-guarantee service as well if he gets the right backing from the manufacturers. He has the trained men, the equipment, the stock and over ten years of experience behind him and, in many cases, the service contract with the local laundrette. Now, presumably, he is to hand over on a plate to Bendix the fruits of such labour and enterprise—they will be quite pleased to take over his trained staff as well! And why the discount cut? As prices tend to fall and purchase tax remains and overheads rise, profits are small enough as it is. Indeed, it is the opinion of many people that eventually the only dealers who can survive the rise in overheads will be those who own their own premises.

Grundig, the tape recorder manufacturers, are another of the direct-to-dealer-cut-discount enthusiasts. Well, there are more than plenty tape recorders on the market at 33⅓% discount and I, personally, feel that a manufacturer has to be a household name before he can afford to deviate from accepted practice and survive: although to reach that stage is becoming well-nigh impossible in these days of too many manufacturers making too many models.

I see that Flatleys are still favouring the full page advertisement including a list of stockists. Their washing machine page in the *Daily Mirror* was most effective—but why does it need the "Free Electricity for Life" gimmick? A good article backed by sound advertising should stand on its own without props of this kind. They are not really effective in boosting sales except, curiously enough, on a rising market. Then they may influence a customer to decide which machine she will have rather than whether she will buy one at all. At present there is no rising market.

Incidentally, I think manufacturers could have second thoughts on tying up their washing machine advertisements with one particular brand of powder. Everyone does not use "Daz," and to associate it exclusively with one maker's machine is, in my opinion, bad publicity for that machine, although it may do a power of good for "Daz."

Sickness Pay

I notice that *The British Manufacturer* is running a two-part article on "Wages during unavoidable absence." It deals with the liability of employers to pay wages during periods of employees' absence through sickness and cites various cases where the issue has been settled in the courts in the employees' favour. Apparently, unless an employee is dismissed when he falls ill, the contract of employment persists and the employer is liable for the full amount of regular earnings plus any bonus or commission which he would have been likely to earn had he been at work. Further, it seems that the employer has no legal right to deduct the amount of sickness benefit. This could easily apply to hourly workers as well, it seems, and doubtless a worker in this class could succeed in an action against his employer, claiming a 42-hour pay week for all the time he was sick. Two things come out of this—that it would pay to be sick (as long as the doctor did not find you out) and that it is time employers took more notice of the form of contract under which they employ labour. The electricity boards have a definite scheme of up to 13 weeks' sick pay for their employees. Perhaps the NECTA might consider some similar form of contract. Some members may have cover in the form of insurance but not all are so well guided.

I end on a sad note—I have just seen the ECA Retail Brochure. It is very much the mixture as before! The only bright spot is the improvement in the jacket colour, but could the powers that be not take another look at the brochures issued by MK, Crabtree's and GEC and produce something better, even if it costs a little more? As it is, it is dull, quite dull.

OVERSEAS NEWS

from our correspondents abroad

CANADA

EHV Breaker Development

Development tests have recently been completed on air blast circuit-breakers designed by Canadian General Electric. The breakers use a common interrupter throughout the voltage range from 115 kV to 650 kV and are claimed by the company as suitable for operation at the highest voltages likely to be used in Canada in the future. The company had invested $2 million in the five-year development and proving programme.

Newfoundland Electrification

On 16 Nov. electrification of the Trepassey Bay area was completed. The scheme has 1,400 miles of line, a power plant and brings power to seven settlements in the district.

Quebec Hydro Share Issue

The recent Quebec Hydro-electric $40 million debenture issue received a favourable reception. It consisted of two maturities, five-year debentures maturing on 15 Dec., 1965, and 23-year bonds maturing 15 Dec., 1983.

Alberta Rural Loans

A further contribution by the Alberta Government to assist farmers in bringing electricity to their farms has increased the total loan since 1953 to $32 million.

New Automatic Substation

An automatically controlled 15 MW transformer substation was brought into service recently at Repentigny in Quebec province. The substation steps down from 66 kV to 12 kV and supplies 2,300 consumers. At the substation opening, it was stated that growth in the Repentigny district had increased more rapidly than anywhere else in the Shawinigan Water and Power Co.'s system.

Nuclear Power Outlook

Disappointment was expressed by the Hon Robert Macauley, Ontario Minister of Energy Resources, that early predictions of nuclear power in Ontario had not been realised. Two stations were, however, under construction, a 20 MW demonstration plant and the 200 MW CANDU reactor near Lake Huron. He said it was expected that by 1980 nuclear energy would be supplying 7,000 MW. However, in the immediate future emphasis would be on construction of more thermal stations.

More Income for Gatineau

Results published by the Gatineau Power Co. for the nine months ending 30 Sept., 1960, show an increase in net income by 14% to $3·5 million and an increase in gross revenue of nearly 10% to approximately $15 million. The increase in revenue is attributed to continuing demand growth for electricity and also to sale of excess power as a result of better-than-average water conditions in the third quarter.

BRAZIL

Nuclear Plant Tenders

Tenders for a 200 MW nuclear energy plant to be built near Angra dos Reis are expected to be called in the very near future. This is reported to have been said by Sr Otavio Dias Caneiro, Director of the Mambucaba project. He said that tenders would be prepared by interested companies in the first half of next year and the selection would be made after July, 1961. Contracts would be signed early in 1962 and building should be finished in four years from that date. Estimated cost of the plant was American $50 million.

WEST INDIES

Bahamas Electricity Demand Rise

During September, electricity generation by the Bahamas Electricity Corporation rose by 14·6% compared with the previous year to 6·5 million units. The number of consumers also rose by 9·2% to nearly 13,000 and the maximum demand was up by 16% to 12·2 MW.

Some vibration trouble experienced on the second of two turbo-generators installed at Clifton Pier station is reported to have been cured by adjustments to the bearings. This station has a design capacity of 10 MW but the output is at present restricted by capacity of the temporary circulating water system. A permanent installation will, it is hoped, be in operation shortly.

One Authority in Jamaica

The Jamaican Government consider that expansion of electricity in the island should be implemented by a single operator. In making this statement the Hon Wills O. Isaacs, Minister of Trade and Industry, said negotiations were under way between the Government and the Jamaica Public Service Co. for a new licence to the company, covering the whole country. The Government would demand that the entire country was supplied with electricity. The frequency conversion scheme now under way would ensure that factories could be located with ease in various parts of the country. The Minister was speaking at the opening of the Savanna-la-Mar power station, reported in the ELECTRICAL TIMES for 1 Dec., for which the consultants were Messrs Ewbank and Partners Ltd.

EUROPE

Nuclear Station in Germany

The German Federal Republic's first nuclear power station came into operation recently. The station is sited near Kahl on the River Main and will be used mainly for test purposes. Built at a cost of about £3·5 million the reactor is owned by the Rhine-Westphalia Electricity Works and was constructed by AEG. Eventually, generation is anticipated to be 15 MW.

EGYPT

Belgian Firms "Sequestered"

Sequestration of the Belgian-controlled Egyptian Electricity Co. and the Cairo Tramway Co. was ordered by the United Arab Republic's Government last Thursday. The announcement put the total value of Belgian property to be taken over at £16 million, of which about £11 million is for the Heliopolis property company.

NORWAY

Development of Natural Resources

Relaxation of laws limiting foreign exploitation of Norway's natural resources has been recommended by a Government-appointed committee in a recent report. The law states that foreigners may only acquire water-course rights for hydro-electric development under special circumstances. The committee has recommended that the special circumstance clause be dropped. It feels that foreign and Norwegian concerns should be similarly regarded for development of natural resources.

If the committee's recommendations are adopted, a present regulation stipulating that hydro-electric power plants should revert to the Government after 35 years would be dropped. A further present requirement, that if the 35-year stipulation is not taken up the station should in any case revert free of charge after 60 years, would also be modified to enable the Government to sign further utilising agreements with concessionnaires. The requirement that the chairman and most of the board would be Norwegian would remain.

Finance for Tokke Scheme

The World Bank has made a loan equivalent to $25 million to Norway to further assist in financing the Tokke hydro-electric development scheme. This undertaking, the largest hydro-electric project in Norway, will consist of three power plants having a combined capacity of 810 MW; transmission lines will also be built to connect networks serving southern and western Norway and to provide a connection with the Swedish grid for the export of power. Ten commercial banks in the United States are participating in the loan, without the World Bank's guarantee, to the extent of $1,231,000. A bank loan of $25 million was made in 1956 to help finance the first stage of the Tokke scheme.

Water Shortage for Generation

A severe shortage of water following an unusually dry summer has provoked power rationing in western and northern districts of Norway. The Bergen authority has chartered two tankers to augment power supplies during the winter. A tanker has also been hired for five months by power authorities at Sandnes near Stavanger. The ship will supply 90,000 kWh/day at a cost of £25,000 for the five months.

GREECE

Athens Acquisition

The Athens-Piraeus Electricity Co.'s undertaking is to be acquired by Greece, agreement having now been reached, it was announced last week-end. The undertaking will be taken over by the Public Power Corporation, the State-owned organisation responsible for electricity supplies outside the capital area. The Corporation will also take over certain long-term and medium-term indebtedness of the company, including the balance of trade credits granted in the UK amounting to £2¼ million. After allowing for this indebtedness, the price for the undertaking has been agreed at £11,106,787, this is after offsetting sums agreed to be due to the Greek State under profit-sharing. The company's concession provides for payment in sterling and it has been agreed that half the sum will be paid before the undertaking is transferred at the end of this year. The balance is payable in sterling over seven years, with interest at 4%. Out of the initial payment of £5,553,394 as the first instalment, £3,557,000 is payable to the UK Treasury under settlement of its first mortgage debenture and interest. The largest interest in the Athens-Piraeus Electricity Co. is held by Whitehall Securities Corporation—one of the Cowdray group of companies. We reported on 8 Sept. last that negotiations had started for the acquisition of the undertaking.

TURKEY

Generating Units Order

A contract for 103 diesel alternator sets for outlying petrol stations in Turkey has been placed with A. C. Morrison (Engineers) Ltd. They comprise Ruston air-cooled diesel engines driving Lyons 6 kW three-phase self-regulating and self-exciting alternators.

INDIA

Millionth Meter Manufactured

The millionth house service meter manufactured by REMCES of Bangalore was recently presented to the Mysore Chief Minister. Presentation was made by a senior director of the Japanese firm, Toshiba, who collaborate with REMCES. Toshiba have recently agreed to manufacture, in the Bangalore factory, meters, relays and permanent magnets. It was possible that they would also manufacture loudspeakers and transistorised radio receivers in the future.

Hydro-electric Survey in Karwar

Survey of hydro-electric resources at Kali Nadi has commenced in the Karwar district. This project is likely to meet the total power requirements in North Karnataka. The Mysore Government is also considering a proposal to construct new thermal stations. This was stated recently by the Chief Minister, Mr B. D. Jatti.

IEC Conference Ends

The international standards conference, which recently concluded its two week annual meeting in New Delhi, was attended by more than 400 delegates from 25 countries. Finalised IEC recommendations covered enamel wire, insulating materials and unification of certain electronic and switch components. Standardisation of electric motors, switchgear and control gear and instruments was also discussed.

Five-year Plan Progress

Some comparisons between the first and second Five-year plans were given recently in Lok Sabha by the Deputy Minister for Irrigation and Power. During the second plan period 2·4 million kW of plant was brought into service as against the target of 3·5 million kW at a cost of £307·5 million expenditure in the public sector, compared with the allocation of £320·25 million. Under the first Five-year plan period installed capacity rose by 1·1 million kW compared with the target of 1·3 million at a cost of £195 million, in the public sector.

Multan Station Tests

Operational tests began recently at the Multan power station in the Punjab. The station burns natural gas, obtained from Sui fields through a 350 km duct. The station was planned by Montecatini Settore Energia, who are also the operating concern.

PAKISTAN

Karachi Power Relief

Addition of 15 MW of generating capacity in the next three months with a further 66 MW by the middle of 1962 will, it is hoped, alleviate load shedding now essential in the areas supplied by the Karachi Electric Supply Corporation. Load requirements at present are running at 58 MW and load shedding has been necessary to bring the load down to 53 MW. The relief afforded by the 15 MW of new plant will not be immediately apparent, however, because overhauls are essential on two older sets which have been operating continuously since 1957.

AUSTRALIA

GEC Golden Jubilee

Fifty years ago the GEC subsidiary, British General Electric, was founded in Sydney. The company now has two works at Rosebury and Aubrun and ten offices throughout Australia.

Open-cast Coal Dispute

The State Government of Western Australia is facing some opposition in re-allocating their coal contracts to include open-cast coal. Until recently, one company has been supplying between 25,000 and 35,000 tons of coal a fortnight at 48s 6d/ton. Under a contract which was to be concluded early in November, the same company was offered a contract for only 11,000 tons, but at the price of 55s 6d a ton. The company rejected the new contract. Two other collieries were offered contracts totalling 20,000 tons, 8,000 tons of which would come from open-cast mines. These two companies have accepted the Government's offer, but the open-cast mines are suffering from a strike by miners at Collie. The Southern Electricity Commission is one of the principal consumers of this coal and they had previously suggested that coal should continue to be supplied on the basis of the old contract.

NEW ZEALAND

Operation Statistics

New Zealand now has a total of 55 generating stations, of which 40 are hydro-electric. These have an installed capacity of 1,200 MW, or nearly 80% of the total installed generating capacity. This information is given in the annual statistics for the year ended 31 March, 1960. During the year, total generation was 6,360 million kWh and the number of consumers, 803,000, represented 34% of the population.

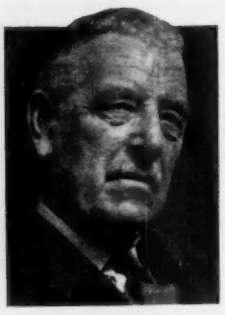
Personalities *in the industry*

Mr S. Fairclough

Mr T. E. Greenfield

Mr E. Broughton

Sir Gordon Radley



Mr W. E. Hind

Mr S. Fairclough, A.M.I.E.E., senior assistant commercial engineer (industrial) at No. 1 sub-area of the Merseyside and North Wales Electricity Board, has been promoted to commercial officer for the Board's No. 3 sub-area at Chester (*ESH, page 138). There, he succeeds **Mr R. M. Gravett,** M.I.E.E., who was recently appointed assistant chief commercial officer (industrial development). Mr Fairclough received his technical training at the Liverpool College of Technology and the Liverpool Corporation Electricity Supply Department. During the war he served overseas with the Royal Engineers, attaining the rank of captain. On his return to the supply industry in 1946 he held positions at Liverpool, St. Helens, Lancs, and later became district commercial engineer at Southport, prior to taking up his present position.

Mr T. E. Greenfield has been appointed sales development manager of the Industrial Process Control Division of Gresham Automation Ltd. Previously, he was with English Electric Aviation Ltd. as head of quality control for the production of guided weapons at their Stevenage works and was also test project engineer for the Thunderbird II. He started with J. Langham Thompson Ltd. in 1946, and three years later joined the General Electric Co. Ltd. at Stanmore, where he was concerned with flight instrumentation trials. In 1953, he returned to J. Langham Thompson Ltd. where he was general (technical) sales manager until 1957, when he joined English Electric Aviation Ltd.

Four recently retired top officers of the Hydro Electric Power Commission of Ontario have joined the Vancouver consulting engineering concern of CBA Engineering Ltd., who state that this strengthening is in the hope of participating in the Columbia River hydro-electric development. The four new members are: **Dr Richard L. Hearn,** former chairman of Ontario Hydro, who becomes president and a director of CBA; **Dr Otto Holden,** chief engineer of Ontario Hydro from 1955 until retiring last July, is to be CBA's senior consulting engineer; **Mr Gordon Mitchell,** who directed field construction on the St. Lawrence Seaway, will be in charge of CBA's construction contracts and programming and **Mr T. G. Willows,** formerly executive assistant to Ontario Hydro's chief engineer, becomes project manager for CBA.

Manager (designate) of the West Wales area of the South Wales Electricity Board is **Mr E. Broughton,** A.M.I.E.E., at present manager of the Board's Rhondda district. Mr Broughton will succeed **Mr W. E. Richardson,** the present West Wales area manager, who, as already announced, is to take over management of the Board's Monmouthshire and Mid-Wales area on 1 March next. (*ESH, pages 130, 132.) Mr Broughton, wo is 52 years of age, has held his Rhondda district appointment since December, 1958. He joined the supply industry in 1925 as a trainee with the Rochdale Corporation Electricity Department and later served with the Southport Corporation Electricity Department and Altrincham Electric Supply Ltd. In January, 1949, he became district engineer of the south west district of the North Western Electricity Board, held that post until March, 1954, when he was appointed construction, operation and maintenance engineer for the Mid-Sussex sub-area of the South Eastern EB. (*ESH, pages 130, 132.)

Mr J. P. Featherstone, who has been director of home sales for J. I. Case Co. Ltd., since its formation on 1 Jan. this year, has been appointed to the board of directors.

At the recent annual general meeting of the Junior Institution of Engineers, **Mr E. E. Burrage,** M.I.MAR.E., was elected chairman.

Sir Gordon Radley, K.C.B., C.B.E., PH.D., M.I.E.E., has been elected a director of the English Electric Co. Ltd. Sir Gordon retired last May from the position of Director-General of the GPO and it was announced in July that he would devote part of his time to work with the English Electric group of companies, particularly in the development of telecommunications equipment for world markets. He was then elected a director of three subsidiaries, Marconi's Wireless Telegraph Co., Marconi Instruments Ltd. and the English Electric Valve Co., and to the board of the associated concern, Marconi International Marine Communication Co. Ltd.

As we briefly noted last week, **Mr W. E. Hind** has been promoted to manager (home sales) to British Insulated Callender's Cables Ltd. He was formerly deputy manager (home sales), having joined the former Callender's Cable Co. in 1920. In his new position, Mr Hind's responsibilities cover all aspects of the selling activities of the company at home, including matters of publicity, public relations, exhibitions and display, and market research. He is a past-chairman of the Rubber and Thermoplastic Cable Manufacturers' Association.

Gold badges, the highest awards for long and distinguished service by members of the top management of the member companies of the International Electrolux organisation were presented to **Mr M. Aitken,** secretary, and **Mr G. L. Hughes,** technical manager of Electrolux Ltd., at the company's annual sales dinner and dance in London recently. Mr Aitken, who joined Electrolux Ltd. 34 years ago, has been secretary of the company for the past 13 years and Mr Hughes, who joined the firm 30 years ago, has been technical manager for 13 years. In addition to these special awards, Sir Harold Wernher, chairman, presented gifts and certificates to 28 employees who had completed 25 years' continuous service with the company.

After 40 years' service in the electricity supply industry in the Midlands, **Mr E. J. James,** a member of the engineering staff of the Midlands Electricity Board,

** Denotes revision to the "Electricity Supply Handbook, 1960."*

retired a few days ago, aged 67. He started with the Shropshire, Worcestershire and Staffordshire Electric Power Co. in 1920 as construction engineer and served in progressive appointments until 1948. In 1931 he was loaned to the Kircudbright County Council to plan the county's transmission and distribution networks, his scheme being adopted in its entirety. Since 1948, Mr James has been a member of the engineering staff at MEB headquarters, serving from 1949 to 1958 as head of the development, planning and operation section; from 1958 to March, 1959, as acting deputy chief engineer and, subsequently, carrying out special engineering duties.

Newly appointed to the board of Lancashire Dynamo and Crypto is **Mr J. B. Spence.** Previously acting general manager at the Willesden works of the company, he is confirmed in that position as successor to the late Mr C. F. Jackson. **Mr D. W. Malim** has been appointed director and general manager at the company's Trafford Park works.

Mr F. K. Dolman, A.M.I.E.E., has been appointed sub-area commercial officer for the Harrogate sub-area of the North Eastern Electricity Board to succeed **Mr C. E. Hind,** who will retire from that position at the end of this month (*ESH, page 153). Mr Dolman is at present senior assistant engineer in the commercial officer's department at Harrogate.

Appointed deputy managing director of Automatic Telephone and Electric Co. from 1 Jan. next is **Mr J. A. Mason,** C.B.E., M.M., M.I.E.E., formerly the company's director (production). **Mr F. O. Morrell,** B.SC., M.I.E.E., formerly director (engineering) is to succeed Mr Mason as director (production). Mr Mason trained with Automatic Telephone and Electric Co., and has been a director of the firm since 1950. Mr Morrell became director (engineering) of the company after being a director of research for British Telecommunications Research Ltd. from 1949 to 1956. Previously he was with the Post Office Engineering Department.

Mr B. C. Scott has been elected to the boards of Cossor Radar and Electronics and Cossor Instruments. **Mr J. S. Gilks** has been elected to the boards of Cossor Communications Co., Lea Bridge Cabinet Works, and Best Products, and **Mr K. P. Wood** has resigned from the board of Cossor Communications Co. and **Mr N. Elson,** who is technical director, also becomes general manager.

Three new directors have been appointed to the board of Westool Ltd. They are **Mr D. Riddell,** who is chief engineer, **Mr D. L. Shand,** the works manager, and **Mr A. G. Why,** secretary and accountant. Mr Riddell joined the company as research engineer in 1946 and was appointed to his present position in 1954. Mr Shand has been works manager since 1958, and Mr Why first joined the company in January, 1959. It is also announced that **Mr G. R. Hook** has resigned from the board after 41 years with the company, during which he was for many years managing director. He was responsible during the war for an extensive programme of development and manufacture for the Admiralty and Ministry of Supply.

Mr D. Craggs has been appointed production manager at the Ekco Radio factory at Kenway, Southend-on-Sea, succeeding **Mr J. D. Brown,** who is taking up an appointment with AEI. Mr Craggs, who has been with E. K. Cole Ltd. since 1937, was previously assistant production manager at the Ekco television assembly factory at Southend.

Mr D. M. Patten, A.M.I.E.E., has been appointed deputy station superintendent at Uskmouth "A" power station, South Wales Division, CEGB, in succession to **Mr P. E. Dickinson,** A.M.I.E.E., A.M.I.MECH.E., who has taken over a similar post at Uskmouth "B." Mr Patten was previously deputy station superintendent at Doncaster and had earlier served at Battersea, Plymouth "B" and Portishead "B" power stations.

After 21 years' service as secretary of B. S. and W. Whiteley Ltd., **Mr L. Musgrave,** F.C.A., retired at the end of November. He is succeeded by **Mr E. M. D. McEwan,** F.C.I.S., who has been assistant secretary for the past ten years.

Three promotions in their Transmission Project Group at headquarters are announced by the CEGB. **Mr B. St. M. F. Webb-Ware,** M.A., A.M.I.E.E., becomes assistant chief transmission project engineer; **Mr D. M. Porter** is appointed administrative officer to the Transmission Project Group and **Mr H. V. Flaxman** becomes engineer-in-charge of the drawing office at that Group (*ESH, page 48). Mr Webb-Ware, who has been coordinating engineer (specifications and contracts) in the Transmission Construction Branch at CEGB headquarters since March, 1948, was educated at Rugby and Trinity College, Cambridge, and spent two years as a student apprentice with A. Reyrolle and Co. This was followed by an appointment as an assistant engineer in the Technical and Research, Switchgear Design and Erection Departments of the same company. Between 1934 and 1938 he was a technical assistant in the south east England office of the Central Electricity Board. His first appointment in the headquarters of the CEB was as an assistant engineer in the System Operations Department, a position he held until 1941, when he became assistant construction and contracts engineer. Mr Porter was educated at Haileybury and after an early career in banking and accountancy he joined the Chief Accountant's Department of the CEB in August, 1932. From then until the outbreak of war he was engaged successively on the framing of the first bulk supply tariffs, internal audit and capital expenditure. During the war he spent five years in the RNVR. Returning to the CEB in 1946, he became an assistant chief accountant in 1952 and an assistant chief financial officer in 1958, which position he has relinquished to take up his new appointment. Mr Flaxman, who was educated in Leeds, served his Articles with consulting engineers. He spent a number of years as a draughtsman and site engineer with private concerns before joining the CEB in 1946 as an engineering assistant in the drawing office. From this post he was promoted to senior section leader and later to second-in-command at headquarters drawing office, the position he has vacated to take up his new appointment.

Mr S. A. Clodd, executive director, E. K. Cole Ltd., has been elected chairman of the Industrial Section of Southend-on-Sea Chamber of Trade. The new vice-chairman is **Mr R. R. Laird,** Ekco personnel manager.

Mr C. E. Walker has been appointed sales manager of Philco (Gt. Britain) Ltd.

Chief Press Officer of EDA, **Mr John M. Fraser** is making a satisfactory recovery after an operation for the removal of toes at Farnborough Hospital, Kent, we are glad to report. Mr Fraser is suffering from sugar diabetes, and at one time there was a risk that he might lose a leg, but this is now unlikely, we understand, although it will be some little time before he leaves hospital.

After 41 years' service with the Associated Electrical Industries Ltd.'s Rugby Construction Department, **Mr J. Stronach,** a native of Dunfermline, has retired. Mr Stronach served his apprenticeship with J. and G. Marshall, Dunfermline, later joining John Brown and Co., of Clydebank, until 1915 when he joined the Merchant Navy as an engineer. After the war he was with Balfour, Beatty and Co. for a year, and joined the BTH Construction Department in Scotland in 1919. From 1925 onwards he spent most of his time in the London district. He took

Mr D. Riddell

Mr D. L. Shand

Mr. A. G. Why

charge of several large turbine contracts in the London area, subsequently becoming assistant to the district engineer, Mr J. W. Turner, on whose retiral in 1947 he was appointed district turbine construction engineer for the London area.

General manager of the GEC Engineering Works at Witton from 1 Jan. next will be **Mr T. H. Kelsey,** M.A., M.I.E.E., at present deputy general manager. **Mr W. D. Morton,** M.A., A.M.I.E.E., A.M.I.MECH.E., manager of GEC Traction Division, is to become assistant general manager at the works. This change follows the retirement of **Mr J. J. Gracie** at the end of December.

Mr G. W. Bone having intimated his wish not to continue as joint managing director of Ruston and Hornsby Ltd. after 31 Dec., 1960, **Mr V. R. Prehn** is to continue as sole managing director until 31 Dec., 1961. From 1 Jan., 1961, **Mr C. T. Alderson** (assistant managing director) is to be appointed deputy managing director with the intention that he should succeed Mr Prehn as managing director by 31 Dec., 1961. Mr Bone will continue as managing director of Ruston's associate company, Davey, Paxman and Co., and become vice-chairman of Ruston and Hornsby.

Previously assistant sales manager of the MO Valve Co. Ltd. (subsidiary of the GEC). **Dr W. E. Rowlands** has joined Walmore Electronics Ltd. as sales manager.

Sir Howard Florey has been elected president of the Royal Society in succession to **Sir Cyril Hinshelwood.** The new treasurer of the Society is **Sir Alexander Fleck,** K.B.E., and **Sir Patrick Linstead,** C.B.E., Rector of the Imperial College of Science and Technology, has been elected foreign secretary. Among the new members of the council are: **Prof J. F. Baker,** O.B.E., Professor of Mechanical Sciences, Cambridge University; **Sir Alfred Pugsley,** O.B.E., Professor of Civil Engineering, Bristol University; and **Sir Gordon Sutherland,** Director of the National Physical Laboratory.

Engineer of the Enfield district of the Eastern Electricity Board since 1948, **Mr S. M. Lejeune,** A.M.I.E.E., is going to the Board's Chilterns sub-area as the engineering senior assistant, planning and development (*ESH, page 110). Mr Lejeune started with the Hendon Electric Supply Co. in 1921, and after three years joined the BTH Co. at Willesden. Following five years' general works' experience, including the development of protection gear, he joined the North Metropolitan Electric Power Supply Co. at Enfield as a junior engineer in 1929.

Chairman of Bowthorpe Holdings Ltd., **Mr J. Bowthorpe** has just returned to this country from a 69-day world tour. His son, **Mr Peter Bowthorpe,** who travelled to Australia with him, has remained in the United States to take up an appointment with the group's subsidiary in New York—Hellermann Corporation—for a two-year period.

OBITUARY

Mr J. W. J. Townley, C.B.E., M.I.E.E., formerly manager of the North Eastern sub-area of the London Electricity Board, and ex-West Ham chief, died on 29 Nov., aged 75. Mr Townley retired from LEB service at the end of March, 1953, but he was probably best known for his 18 years' work as borough electrical engineer and manager at West Ham prior to vesting day. There he was responsible for many innovations which brought rapid electrical development, and he was also primarily responsible for the construction of the West Ham "B" power station. He was awarded the C.B.E. for his work in improvising supplies during the air raids, in which West Ham suffered severely. Born in Scotland, Mr Townley gained experience with electricity undertakings at Paisley, Manchester, Ashton, Sunderland, Barnsley and Bradford (where he was deputy city electrical engineer) prior to serving as chief electrical engineer to LCC Tramways from 1927 to 1929, when he went to West Ham.

Mr J. W. J. Townley

Mr Alexander Kelso, M.I.E.E., manager of the Glasgow area of the South of Scotland Electricity Board, died on 28 Nov., aged 62. A native of Fife, Mr Kelso flew in the first world war with the Royal Flying Corps. Afterwards he entered the electricity supply industry and was for a number of years with the Fife Electric Power Co. In 1934 he transferred to Harrogate and in 1939 became borough electrical engineer and manager there. He served in that capacity until 1948 when he was appointed to the position he held at the time of his death.

Mr F. Shapley, assistant manager, British Engine Boiler and Electrical Insurance Co. Ltd., Manchester, died on 27 Nov.

Mr J. D. Spark, M.I.E.E., formerly chief electrical engineer and manager to Willesden Corporation, died on 2 Dec., aged 80. He started his career with Aberdeen Corporation Electricity Department, and after a period with the Northampton Electric Light and Power Co. was assistant distribution engineer at Croydon for nine years, and distribution engineer at Swansea for two years, before going to Willesden where he was deputy electrical engineer for 14 years prior to becoming chief.

Mrs M. E. Vallance, a director of Vallance and Davison, electrical and radio dealers, of Bradford, and wife of the managing director of that company, died on 27 Nov.

Mr J. R. Spanswick, B.SC.(ENG.), M.I.E.E., M.I.MECH.E., manager of the Thermal Process Section, Metal Industries Division of the English Electric Co. Ltd., died on 4 Dec., aged 49. Prior to joining English Electric in 1959 he was with the Electric Furnace Co. for 24 years.

CEGB Plans 400 kV Transmission

NEXT step in transmission voltage for the CEGB is 400 kV, not 380 kV as originally planned. The change is to be accompanied by use of four-conductor bundles which will increase carrying capacity for a double-circuit line to 3,000 MW, against the 1,200 MW capacity accorded to a standard 275 kV line today, using 0·4 sq in. double-conductor bundles.

In announcing the decision to make this change, the CEGB recall that the majority of existing 275 kV supergrid lines were designed with an eye to future conversion to 380 kV. The plan now is to re-insulate them when the change becomes appropriate for operation at 400 kV. This change, with the two-conductor bundle retained, and only the insulators changed, will give an increase in transmission capacity to 2,000 MW for a double-circuit line.

So far there have been no practical trials even with 380 kV. The existing position is that equipment has been ordered for a 380 kV experimental line between Monk Fryston and High Marnham, which is due to come into service in 1962. However, the CEGB feel that knowledge of technology is far enough advanced to permit orders for 400 kV equipment to be placed in the near future without waiting for the trials results.

The first 400 kV line should come into commercial service in 1962. From then on, the new voltages will be introduced gradually to meet growing demands.

For the 3,000 MW lines, a new design of tower will be introduced, 20 ft higher than the existing 275 kV towers, and of course considerably heavier, because of the greater mechanical strength required. This tower will be strung with four-conductor bundles, each made up from 0·4 sq in. copper equivalent steel-cored aluminium conductors, the same size as those used for the 275 kV lines. The difference between the rating accorded to these lines (50% greater than for a two-conductor bundle) and the apparent increase in conductor material (double that for a two-conductor bundle) is accounted for by system stability considerations, which usually make it impossible to use the full thermal capacity of overhead line conductors.

The CEGB state that studies have shown that there is no great economic advantage to be gained in the UK by use of the 400 kV voltage. The big gain is in amenity, because fewer new lines will be required.

Transformers in court

THREE-YEAR PRICE REVISION. ONLY ONE YEAR'S WORK ON FACTORY ORDER BOOKS. PLAN TO EXTEND T.M.A. FAILED

WITNESSES called by the Transformer Manufacturers' Association are continuing to give evidence before the Restrictive Practices Court. As we reported last week, the second witness for the Association, Mr R. M. Hobill (general manager, Transformer Department, Ferranti Ltd.) supported the argument that loss of the Association's home price agreement would make the export agreement ineffective. He said the only reason for difficulty in obtaining orders in the export market was the "absurdly low prices" Continental competitors were quoting in foreign markets. Continental manufacturers' prices were low because they had excess capacity and were cutting prices to keep their factories occupied.

Speaking of Ferranti's order book, Mr Hobill said the value of unexecuted orders in his department at present was equivalent to about one year's work, or an output of about £5 million. Bearing in mind that some transformers were ordered for delivery two or three years ahead, he felt they were on very thin ice. He thought suggestions that an object of the agreement was to ensure stability of profit were true, but that was by no means the only object of the agreement. The endeavour of members of the Association had to be to ensure stability of price, no matter what market conditions might be.

Mr Hobill explained how the Association fixed prices. The price was fixed by the average of the three lowest costs, which meant that the price was less than that of at least seven members. It might be a fraction better than the price returned on the lowest cost and probably a little worse than that for the third lowest cost. But, taking the group as a whole, it certainly represented an extremely low cost. This meant it offered an incentive to increase efficiency, because members showing higher costs had to improve their efficiency to achieve a reasonable profit level. (It had been explained earlier in the case that the price fixed by this method might be further reduced by a "selling factor" taking account of competition from outside the Association.)

Under cross-examination, Mr Hobill suggested that the export agreement could not possibly be retained if the home agreement was abandoned. He agreed that as long as home prices were higher than export prices, Association members would not be anxious to seek for export orders; but if for the purposes of increasing exports, prices in the home market were cut even more drastically, the industry would go out of business. If price-cutting competition began because the agreement was ended, reduction of quality would be brought about eventually from the sheer economic pressure of a small profit margin.

Commenting on a suggestion that the Association had kept up prices where it would have been proper and reasonable to reduce them, Mr Hobill said he did not think the Association had taken unfair advantage of the circumstances. Object of the Association was to maintain prices and maintain profit levels. Occasions when it had kept up prices were "fairly isolated." They involved using the agreement against the pressure of a buyer.

In re-examination, Mr Hobill said that during the past 12 months transformer prices in the USA had fallen by about 30%. He was succeeded as a witness by Mr A. R. Kevan, who is responsible for the Sales Tender Office of the Transformer Tendering Department of the English Electric Company. Mr Kevan explained the basis of costing of various types of transformer. He said that the Association's intention was to effect a re-costing, giving new price schedules, about once every three years.

New Members Sought

Mr Kevan told of a meeting held last June at which the five largest manufacturers of transformers, not members of the Association, met representatives of manufacturers who were members, to discuss the possibility of their joining the Association. He agreed that the idea was that if the five firms had been willing to join, the TMA might have reduced prices for transformers up to 200 kVA rating to be around the level of labour and material costs, so as to drive out of business non-members of the Association. Prices for larger transformers would have been raised to give a reasonable profit margin.

Mr Kevan said that correspondence had shown that the "independent" manufacturers would turn down the proposal before the meeting was held. The Leeds meeting was not discussed with members of the Association beforehand. He and others attended the meeting as individual manufacturers, not as members and officers of the TMA.

Under further questioning, Mr Kevan said he went to the Leeds meeting "with an open mind and dubious of what might come out of it." He did not think the Association management would disapprove of price leadership with pressure vested in the Association, even though that involved increasing or reducing prices collectively to deal with competition from non-members.

Later Mr Kevan was asked if certain documents showed any consideration of the public interest. He replied that he had not yet seen a definition of what was the public interest. His own interpretation was, a fair return in payment for a fair price. He thought the interests of the public were served by profit levels being maintained.

The case so far . . .

The ten-member Transformer Manufacturers' Association is defending before the Restrictive Practices Court its agreement providing minimum prices for transformers sold for use in the UK. In the opening statement on behalf of the Association, much was made of the need to have such an agreement if there was to be a parallel agreement for co-operation in the export field. The need to co-operate as a source of strength in bargaining with the supply industry was also stressed. Witnesses for the Association have drawn attention to under-employment of the capacity of the industry at present and have underlined its difficulties in selling overseas. The case began on Monday, 21 November, and will last several weeks.

Electrical equipment on the *s.s. Oriana*

LAST OF THE D.C. PASSENGER LINERS?

THE sailing last week of the new P and O—Orient liner *Oriana* on her maiden voyage over the route which she will be covering with the sister ship *Canberra* next year enables the electrical systems to be contrasted. Whereas the *Canberra* will, as described in our 24 March issue, be the first British liner to incorporate both turbo-electric propulsion and an all a.c. electrical system, the *Oriana* is conventional turbine/gear propelled with 220 V d.c. electric plant throughout.

The turbines for main propulsion are of the mixed impulse reaction type, made by Vickers-Armstrongs to a Pametrada design, three of which are gear coupled to each of the two 28-ton propellers to provide a normal total shaft horsepower of 65,000 at propeller speed of 147 r.p.m. with about two-thirds of this from the reversing turbines. Stop valve temperatures and pressures are 960°F (reduced to 825°F for manoeuvring) at 700 lb/sq in. from four Foster Wheeler water-tube boilers which also provide the steam for the four self-contained pass-out, pass-in Allen turbines coupled to 1,750 kW, 220 V d.c. generators. Each turbine will pass-out up to 7,500 lb steam/hr at 65 lb/sq in., passing-in at the same pressure but at lower temperature, for heating installations throughout the ship.

When the boilers are shut down, 220 V d.c. supply can be maintained from two 200 kW 220 V d.c. diesel generator sets, also of W. H. Allen make. The main generators are of compound wound, water-cooled design and are coupled to the alternators through Allen-Stoeckicht epicyclic planetary type gears with a ratio of 11·35:1.

Main distribution starts from the 65 ft long Whipp and Bourne switchboard, of the dead-front pattern, which distributes the current to 22 auxiliary boards throughout the ship. Main cables, of 660 V grade, are insulated with varnished cambric and lead sheathed. Smaller cables are of heat-resisting rubber-insulated types which have been treated with fire-resisting compound. In all, about 400 miles of cables are installed on board, a large proportion of which was of Johnson and Phillips manufacture.

No less than 28 Allen pump units, ranging from the 200 h.p. 16,500/24,000 g.p.h. main circulating pumps down to the six 2½ h.p. condensate extraction pumps and 222 Allen electric motors, from 550 h.p. to ½ h.p., are on board complete with the associated control gear. The largest motors, four 550 h.p., are for driving the Vickers broadside manoeuvring units similar in design to those described for the *Canberra* but push-button controlled from the bridge. Another interesting feature is the electric turbine turning gear designed and manufactured by AEI which, by means of a 20 h.p. motor coupled to the turbine pinion shafts, slowly turns the turbines while cooling to prevent shaft distortion. The system incorporates safeguards against inadvertent engagement when the turbines are running or admission of steam to the turbines while the gear is engaged.

An additional safeguard against loss of supply is provided by the 220 V 320 Ah Britannia heavy-duty nickel cadmium battery and, for communication services, a 24 V 275 Ah unit.

A single Denny Brown stabiliser, governed by a Muirhead gyro unit, limits the roll in heavy seas to about ±3°.

NEW L.T. RESEARCH FACILITIES

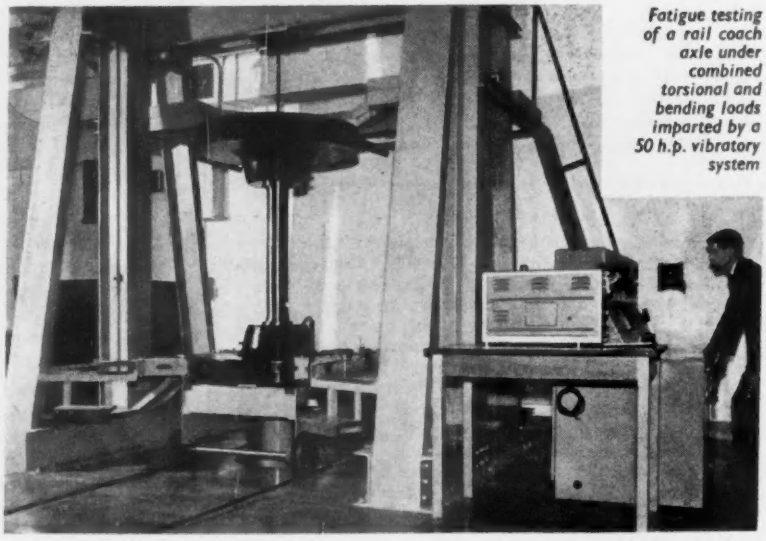
AFTER nearly 40 years and one false start interrupted by the war, London Transport has now its own central research laboratories. The new building at Chiswick, officially inaugurated by the chairman of the LTE, Mr A. B. Valentine, last Monday, is a handsome modern structure to the design of Adie, Button and Partners in association with the LT architect, Mr T. R. Bilbow, F.R.I.B.A., providing a total floor area of 26,000 sq ft, for the carrying out of chemical, physical, metallurgical and electrical research related to public road and rail transport vehicles.

On Friday, the Director of Research, Mr A. T. Wilford, welcoming a Press party to a tour of the buildings, said that the cost of the new facilities, together with equipment, was about £250,000 but one successful investigation alone, that into low viscosity lubricating oils for diesels, had been responsible for saving well in excess of this figure per annum in diesel fuel while a further annual saving of half the sum could be accounted for in two other projects, one on battery development and another on rear axle oil for buses.

A great deal of the work was, naturally, in regard to paints, fuels and oils but metallurgical and fatigue problems were also being given considerable attention. Axle fatigue is a current study for which a special test rig, driven by a 50 h.p. motor, has been contrived to impart torsional and bending stresses to full size axles as used on the London tube trains. Electrical test methods are also being used for crack detection with a further method, currently being developed, for establishing the depth of cracks. Another important item of equipment is a 260 kV X-ray unit for radiographic examination of metal microstructure.

The new facilities also enable life tests on low voltage bus lamps to be carried out, the lamps being to a LTE specification calling for 1,000 hr nominal life. Examination of transformer oils for substation equipment, including high voltage test, is also performed here.

Although the facilities are intended primarily for London Transport, they will, as in the past when the work was carried on in small huts and adapted premises widely distributed, also be available to help in solving transport problems which may arise in any of the other national or municipal transport undertakings.



Fatigue testing of a rail coach axle under combined torsional and bending loads imparted by a 50 h.p. vibratory system

Future of street lighting

MODERN BRITISH ROAD SURFACES DEMAND NEW STANDARDS

SURPRISING as it may seem, the quality of street lighting in this country has been showing a general deterioration. This apparently anomalous situation constitutes the *raison d'être* of a paper* presented last Thursday at the IEE. The paper sets out to review existing British street lighting practice and to investigate possible new approaches based on experiments carried out both here and abroad. The clue to the current situation is not very difficult to discover. Quite simply, it is that the geometry of many present-day installations, conforming as they do to space/height ratios intended for pre-war shiny-surfaced roads, are just not suitable for the anti-skid surfaces in vogue today. The latter may have excellent frictional properties, but, unfortunately, their dark, matt surfaces present a considerable problem to the illumination engineer. This was demonstrated most convincingly by the authors in their presentation lecture, with the aid of a scale model and closed-circuit television. The comparative luminance of such surfaces can be clearly seen in Fig. 1. Lit by column-supported lanterns having the old-established 5 : 1 spacing/height ratio, results are distinctly patchy; illumination effect of even the lighter patches is poor and in addition, using high-angle beam lanterns at the standard mounting height of 25 ft, glare becomes excessive.

The paper considers three categories of "street lighting," namely, main highways, side roads, and shopping thoroughfares. Each of these demands a separate lighting technique in relation to differing requirements, but the central problem common to all three categories remains that produced as a result of the light-absorbing properties of modern road surfaces.

Glare

What, then, are possible remedies? In suggesting these the authors compare methods adopted on the Continent and in America, although they stress that criteria for what is considered good lighting tends to differ from country to country. Common to all countries is the principle of "silhouette vision," meaning that the object in view is distinguished by its dark appearance against an illuminated background, in this case the road surface. British practice aims at uniform illumination at an average value of about 4,500 lumens to 6,500 lumens/100 linear ft of road. Continental practice, on the other hand, places more emphasis on reduction of glare at the expense of uniformity. A feature distinguishing British from Dutch practice is that the latter specify luminance or brightness of road surface rather than illumination incident on it.

Clearly, the problem to be faced in this country is to reduce patchiness produced by existing spacing/height ratios and at the same time to increase illumination values to offset the greater light absorption of rough road surfaces. At the same time, these results must be achieved without increasing glare from the lanterns—in fact, the aim is to reduce it as much as possible. Taking a main highway as an example, specified lighting requirements can be approached by reducing the spacing/height ratio to 4 : 1 or less and by increasing illumination to between 10,000 to 20,000 lumens/100 linear ft. Choice of spacing/height ratio for a given patchiness depends whether high-angle, medium-angle or cut-off lanterns are used. Cut-off lanterns, much favoured on the Continent, produce least glare but mean closer spacing for a given column height. Alternatively, the required spacing/height ratio can be maintained by increasing mounting height to a suggested 30 ft to 35 ft. This has the advantage of requiring less columns, making for a tidier-looking installation in the day-time.

Colour

The specified geometry of lighting installations having been altered to suit modern road surface conditions, the authors consider that there are still other lines along which improvements can be followed. Thus, the degree of annoyance produced by glare has been shown, by recent experiments, to depend quite significantly on colour of the light source. Of those observers taking part in one experiment, 80% preferred sodium-vapour to the equivalent plain mercury-vapour lamp, although the latter was said to possess certain other advantages making up for its defect in respect of glare. This would suggest the use of mercury-vapour lamps only when in conjunction with cut-off type lanterns.

The question of colour rendering of particular lamp sources is relatively unimportant in the illumination of

Fig. 1. Comparison of two different road surfaces. Dark foreground due to rough anti-skid surface contrasts sharply with smooth road ahead

* Paper No. 3260: "A Survey of Street Lighting and its Future," by W. R. Stevens, B.SC., M.I.E.E.; H. M. Ferguson, A.M.I.E.E.

main highways. This is not so when considering side roads and public thoroughfares and is a reason why the time-honoured tungsten lamp has held its own for so long in this application against more economical discharge lamps of the type already mentioned. The introduction of the colour-corrected mercury-vapour lamp presents a challenge to the tungsten lamp, although initial cost is higher and its bluish-white colour rendering not quite so satisfactory. Normal indoor-type fluorescent lamps are also being used, although their length tends to make the outdoor lanterns expensive.

Public Thoroughfares

A particular problem in lighting shopping thoroughfares and other public places, is the importance of eliminating or reducing the number of support columns and thus to free pedestrians and other traffic from unnecessary obstructions. One method is to mount lanterns on the walls of shopfronts as in the case of a high-street installation quoted, which uses 140 W discharge lamps at a height of 25 ft with 40 ft opposite spacing. Illumination produced is 20,000 lumens/100 linear ft. Another solution is that which has been applied to the illumination of an open city square in Munich. Here, a lantern weighing 1·2 tons and made up of three 20 kW xenon lamps and six colour-corrected mercury-vapour lamps, is mounted on top of a single 100 ft pole. It lights an area of about 55,000 sq ft, which is illustrated by Fig. 2.

While, as is implied in the paper, there is a realisation that British street lighting is not all it could be, both in quality and extent, there is general reluctance on the part of public authorities to spend money on improvements. Although a good deal of pioneering work has been carried out by the Road Research Laboratory, local lighting engineers seem to be slow, compared with their contemporaries abroad, to seek or adopt unconventional methods of solving problems. The authors conclude with a plea for not only improvement in illumination standards of existing roads, but extension to the new motorways. The installation cost of motorway lighting, which is about £2,000 to £3,000 per mile for a single carriageway, represents only 2% to 3% of the total cost of the road. In addition, there is a running cost of £700 per mile per annum; even so, it has been estimated that the resulting decrease in accident rate would easily justify these costs.

Fig. 2. City square in Munich lit by 1·7 million lumens from a single 63 kW lantern

DISCUSSION

Opening the discussion, DR J. W. T. WALSH, NPL (retired), agreed that British street lighting was dominated by the pre-war code of practice, which was laid down in 1937. It should be borne in mind that this was formulated not only in relation to road surfaces existing at that time, but also to the cost of light, which was 20 times what it is today. He was glad that the authors had emphasised the importance of spacing/height ratio in installation design, but added that street width was also important in determining lantern mounting height. Speaking of optimum spacing/height ratios he pointed out that a value of 4:1 had been put forward as long ago as 1892. In conclusion, he endorsed the authors' view that the problem of improvement was not technical but mainly financial, due to the anomalies of local administration. There was, he said, an extraordinary multiplicity of lighting standards in operation throughout the country which had to be rationalised before any further progress could be made.

Challenging the figures of the poll quoted by the authors concerning glare from sodium and mercury-vapour lamps, MR H. R. RUFF, AEI, said that results of such tests depended a great deal on luminous intensity of the light sources and the effect of background illumination pertaining under practical conditions. Disagreeing with the authors, he said that high-angle beam lanterns were no longer used to any great extent in this country. On the other hand, lip service was paid to medium-angle lanterns because of their reputed economy. He went on to say that he considered that the 70° cut-off lantern offered the best compromise for present conditions.

MR H. JACKSON, South Wales Electricity Board, considered that the costs quoted for single carriageway main highway lighting were reasonable. He compared these with a dual-carriageway installation near Cardiff costing £11,700 for 1·93 miles. This used medium-angle lanterns with sodium-vapour lamps having 4·5:1 spacing/height ratio. It gave very satisfactory results with an illumination value of 9,600 lumens/100 lin ft. Judging from the performance of this particular installation, of which he had personal experience as a motorist, Mr Jackson thought that the maximum figure of 20,000 lumens/lin ft specified by the authors might be a bit on the high side.

MR F. C. SMITH, defending public lighting engineers, said that they were very much alive to the lighting requirements demanded by present-day conditions and the urgency of the problem in view of the growing accident rate. He reiterated the authors' statement that Class A lighting on main roads could cut down accidents by as much as 30%. He praised the efforts of "back-room boys" for progress made in the efficiency of light sources, providing the means for improvement of installations.

MR S. S. BEGGS endorsed other speakers in saying that good lighting could not be obtained without paying for it. Considering the efficiency of anti-skid surfaces, he said that a sideways frictional force coefficient of 0·5 was quite good enough for road-holding purposes, while it gave a luminance factor of half that of pre-war surfaces. This seemed to be a good compromise.

MR H. M. FERGUSON, replying to the discussion, said that Dr Walsh's historical reference to spacing/height ratio was an illustration of the present malady in street lighting.

There were at the present time so many lighting authorities in the country that if each of the existing lighting authorities and the potential lighting authorities were to put up a single street lighting lantern—to the code of practice, one would hope—the installation which would result would extend from London to York. That was an indication of the problem with which the country was confronted. He was not decrying the efforts that were being made by the lighting authorities. On the contrary, he sometimes wondered how it was that they did so well in such difficult circumstances. He emphasised that what was wanted was uniformity of quality of lighting rather than uniformity of light source. Indeed, they did not particularly want to have uniformity of the type of light source or the type of light distribution. Variety was the spice of life even in street lighting, provided that it was kept within reason.

Electronic telephoning

I.E.E. CONFERENCE ON EXPERIMENTAL EXCHANGE

TELEPHONE engineers from many countries attended an IEE conference, held last month, on the subject of electronic telephone exchanges. The idea of replacing the moving parts of the conventional electro-mechanical exchange by static electronic equipment has many attractions, and the Post Office plans to bring into operation within the next two years an experimental exchange at Highgate Wood, North London. Many of the papers presented at the conference were concerned with this and these form the basis for this article.

Highgate Wood will make use of the idea of time separation rather than space separation between different calls. The central electronic apparatus will be common to all calls, instead of there being a separate conductor path through the exchange for each call, as in a conventional exchange. The technique used is "time division multiplex" (t.d.m.), well known in telecommunication engineering but not previously applied to a public telephone exchange.

As applied at Highgate Wood, t.d.m. involves sampling the incoming audio frequency signal from a speaking subscriber at a repetition rate of 10 kc/s and using the amplitude to modulate a pulse of 0·8 microsecond duration which occurs in a pulse time of 1 microsecond allocated to each channel. Fig. 1 shows the principle adopted. Pulses are repeated every 100 microseconds. Terminating equipment for each line at the exchange includes modulating circuits and demodulating circuits which extract the audio component from pulses and amplify it before passing it out of the exchange.

Within the exchange, each connection is in four-wire form, two wires for each direction of speech between two subscribers. Connection of two lines is arranged by providing that they are connected only at the times appropriate to the channels (i.e., pulse times) that have been allocated to them. This is secured by applying the appropriate channel pulses to "gating circuits," which otherwise block the output from particular subscribers.

For electronic reasons, it is arranged that the circuit in one direction is opened 50 microseconds after the circuit in the other direction; so two channels are occupied by any one call. One hundred microsecond magnetostrictive delay lines control the gates, and they are centre-tapped to give the required 50 microsecond separation.

Highgate Wood

Highgate Wood will have facilities for 3,200 lines (subscribers plus junctions from other exchanges, etc.). There will be four groups of 800 lines, each having access to 100 channels. Each group of 800 lines connects to a pair of highways. Provision is made for connecting groups of lines through pulse-operated gates, as shown in Fig. 2.

A rotating magnetic drum storage system is used for setting up a call, from the initial receipt of dialling pulses to the finding of the required subscriber or the necessary connection to another exchange.

Magnetic drums carry information about each exchange subscriber, covering points such as directory number, physical connection to exchange, whether the line is "busy," and many related details, such as whether a number is one of several on a p.b.x. exchange. The drum is scanned for one complete revolution to find whether a calling subscriber should be connected or given a number engaged or number unobtainable signal. Information from it is then used for setting up the call if this is possible.

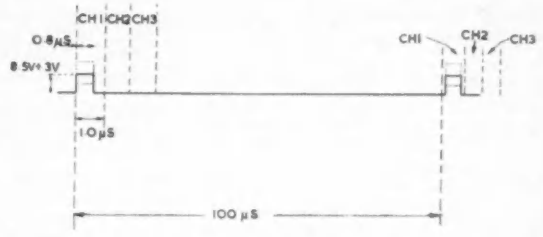


Fig. 1. Channel pulsing for t.d.m. system. Pulses have mean amplitude 8·5 V with maximum modulation ± 3 V

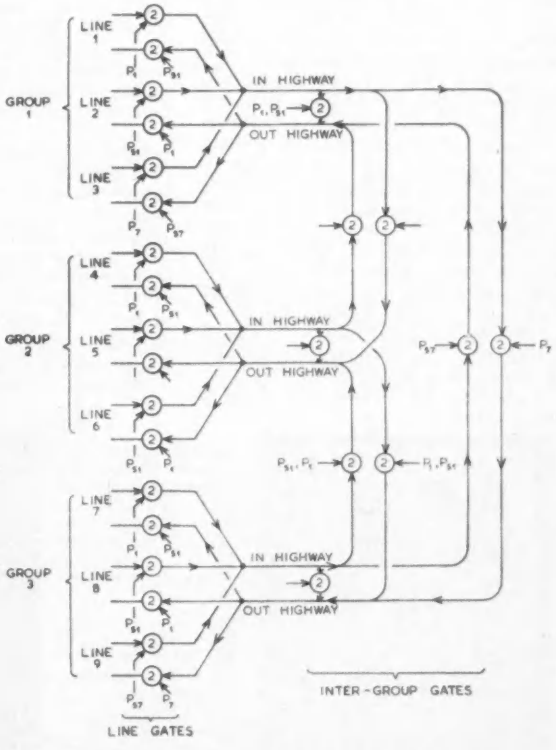


Fig. 2. Speech interconnection on t.d.m. system. Pulses at 50 microsecond intervals effect connections as shown. Note how inter-highway and inter-group gates permit one channel to be used several times. Lines connected are 1-2, 3-9, 4-8, 6-7

equipment for industry

Alkathene prices cut

RECENTLY the price of Alkathene was cut by 4d/lb to 1s 10d/lb. This fourth price reduction represents a total of 33% over the last two years and has been made possible by increased use of polythene. *Imperial Chemical Industries Ltd., Imperial Chemical Hse, Millbank.*

Standby diesel control

AUTOMATIC start-up and shut-down for a standby diesel generator is accomplished with the "Sicon" mains failure control panel recently introduced. The panel is said to be suitable for emergency standby supplies for hospitals and communications systems. If a supply failure occurs, the panel isolates the mains from the load, applies a starting signal to the diesel engine and, when the correct system voltage has been attained, connects the alternator to the load. When mains voltage is restored the panel disconnects the alternator and shuts down the diesel. Provision is included on the panel for routine testing of the diesel and various alarms are provided.

Two other products have also recently been introduced by the same company. They are a counter with a range from 0·1 c/s to 120 kc/s and a switching panel. Special features of the counter are its very high input impedance and a latching system which retains a count while a subsequent count is in progress and only changes the display if, at the end of the counting period, there is a discrepancy between the two. Easy reading is ensured by using a digital display on projecting indicators which have a black background. The instrument incorporates a crystal clock which allows time intervals between 0·1 millisec and 10 sec to be measured.

The switching panel is designed for use with the Southern FM System and enables outputs from up to four oscillators to be displayed on an oscillograph. The panel is for use in conjunction with oscillators controlled by single capacitance or inductance types of transducer. The switching controls permit reversal of signal polarity and also independent adjustment of each channel amplitude so that any transducer signal can be displayed without readjustment of the controls. *Southern Instruments Ltd., Frimley Rd, Camberley, Surrey.*

Boiler feed analysis for silica

ACCURATE knowledge of the quantity of silica in boiler-feed water becomes of increasing importance for high-pressure boilers operating above 900°F. Above this temperature silica volatilises and may form deposits on turbine blades and other items of equipment. An instrument for accurate assessment of the concentration of silica in feed water has recently been introduced. Essentially, it is a colorimeter which compares the colour of treated feed water with a reference. Silica concentration is revealed by adding two solutions to a feed water sample, which then becomes blue in colour. The silica analyser is claimed to make an analysis in 12 minutes and is available in three ranges for 0-0·2 parts/million to 0-30 parts/million. Detection of the colour difference between the feed water and the reference is by a photo-electric cell feding a transistor amplifier. An accuracy of ±5% f.s.d. is claimed and calibration is said to be simple. The instrument is housed in a glass fibre cabinet measuring 34 in. by 17·5 in. by 12 in. *Electronic Instruments Ltd., Richmond, Surrey.*

Emergency stop button

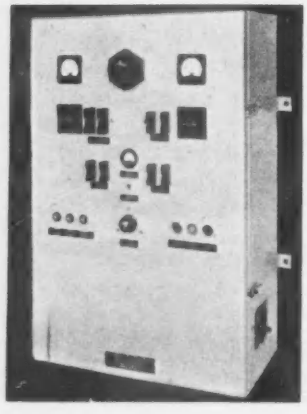
EXTENDING their range of pendant control switches, Nettle Accessories have recently introduced an emergency stop segment which can be incorporated in a crane switch assembly. The switch segment has a mushroom headed red stop button to enable quick, easy operation in an emergency. The button can be engraved either "STOP" or "EMERGENCY STOP." Price of the segment, reference CS.06, when incorporated in a pendant assembly is 2s 8d. *Nettle Accessories Ltd., Warren St, Stockport, Cheshire.*

Inspection approval

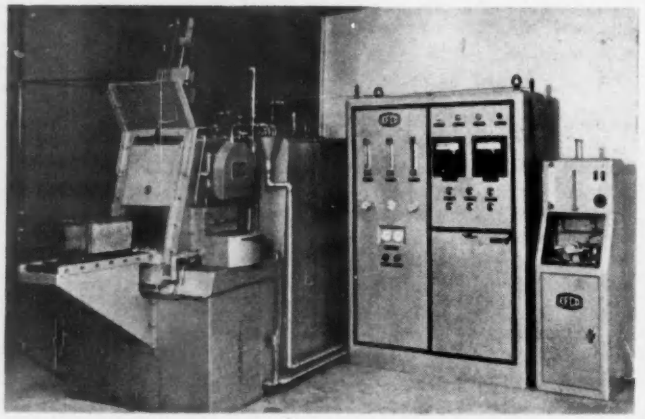
THE inspection facilities at the Oxted factory of the International Rectifier Co. have been approved by the Ministry of Aviation and the Air Registration Board. The company are now manufacturing semiconductor diodes for high voltage rectifiers. They include a stud-mounted version for 1,500 p.i.v. and 300 mA and a range of ceramic devices suitable for 100 mA at from 2 kV to 12½ kV. *International Rectifier Co. Ltd., Hurst Green, Oxted, Surrey.*

Electric quench furnace

SUPPLEMENTING their extensive range of furnaces for the machine tool industry, Efco have introduced recently their junior size furnace to provide closed-quenching facilities for economically processing small production batches. The furnace has a horizontal heating chamber, purging chamber and an oil quench tank. Work to be heat treated is placed in baskets, which may be as large as 14 in. by 8 in. and 8 in high. These enter the furnace through an outer door complete with a gas screen to prevent air ingress. Pneumatic controls are included for the heating chamber and outer door and also for the charge elevator. Heat is provided by 15 kW radiant tube elements arranged for direct connection to a three-phase supply. They are placed in a single controlled zone which can produce furnace temperatures up to 950°C, with uniformity maintained by a circulating fan. The oil quench tank has an oil cooler and a motor-driven agitator. *Electric Resistance Furnace Co., Netherby Queens Rd, Weybridge, Surrey.*



One of the 21 new products introduced this year by Southern Instruments is this "Sicon" diesel control panel for starting-up and shutting-down emergency standby generator sets



This Efco quench furnace for small batch production has 15 kW heating elements and a circulatory fan driven by a water-cooled motor

for the electrical trade

Lighting the "space age" home

THE range of "Space Age" lamp standard lighting fittings has been growing steadily and now covers a wide selection of unusual designs. The range includes table lamps, single, double and triple floor standard models, notable for their variety of shade and stand design. Shades are of plastics tape in some cases, in bright contrasting colours wound on to steel frames. Novel yet smart in appearance these fittings should be as effective unlit as illuminated. Illustrated below are some of this season's models, selling at prices up to £10 4s 9d tax paid. *Satelights, 352 Cricklewood La, N.W.2.*

Christmas tree price

OSRAM announce that the price of their illuminated miniature Christmas tree is £2 5s 6d tax paid and not £1 18s 10d as previously stated. The tree, mentioned on this page in 17 Nov. issue, is 21 in. high and fitted with a 20-bulb "Lilliput" decoration set. *The General Electric Co., Magnet Hse, Kingsway, W.C.2.*

New fish and chip fryer

A TABLE model fish and chip fryer is added to the range of EUK catering equipment. Known as "Fryette," the cooker has a capacity of two gall fat or oil and will fry 24 lb of chips/hr. Heat is provided by a 2·5 kW sheathed element within the well, controlled by a variable thermostat incorporating an on/off switch. The top is fabricated from stainless steel, with steam box, flue outlet and a fire safety damper. Body has a finish of blue-grey mottled vitreous enamel and is mounted on four rubber feet. Price: £51 10s. *EUK Catering Machinery, Oldham.*

TRADE PUBLICATIONS

IEC-SIEGER.—Technical pamphlet describing an electronic gas detector. 39 Parliament St, S.W.1.

M.K.—Leaflet No. 257, describing plaster depth boxes and square 3-gang plate-switches for use with them. M.K. Electric Ltd., Shrubbery Rd, Edmonton, N.9.

TORBAL.—Illustrated leaflet and price-list of portable precision balances. Baird and Tatlock (London), Freshwater Rd, Chadwell Heath, Essex.

PLASINTER.—19-page illustrated booklet introducing the Plasinter process of decorative/protective plastics coating. Plasinter Co. (The Plastic Finishing Co.), Wednesbury, Staffs.

MODERNEON.—45-page loose-leaf reference book on cold cathode and fluorescent illuminated signs and lettering. Moderneon, 66-68 Brewery Rd, N.7.

AQUASTAT.—26-page illustrated booklet, "The Aquastat Guide," on controls and control systems for hot water central heating equipment. Honeywell Controls Ltd., Greenford, Middx.

P.C.—Illustrated folder on Rising Main Busbar Trunking. Power Centre Co., P.O. Box 18, Lloyd St, Wednesbury, Staffs.

KANATHANODE.—32-page booklet, "D.P. Kathanode Traction Batteries," illustrated. The D.P. Battery Co., Bakewell.

I.A.E.A.—Coloured 22-page booklet listing publications issued and in preparation by International Atomic Energy Agency, Distribution and Sales Unit, Kärntner Ring, Vienna 1, Austria.

ULTRASONOSCOPE.—General catalogue of ultrasonoscopes and accessories for testing of metals. Cat. Ref. 010760/H2M. Ultrasonoscope Co. (London) Sudbourne Rd, Brixton Hill, S.W.2.

SANDERS.—Revised price-list, November, 1960, No. 161/60, of electrical accessories. For use with Catalogue No. 158/59 and leaflets 59/59 and 60/60. Sanders and Co. (Wednesbury), 78 Neal St, London W.C.2.

New fluorescent fittings

A NEW range of commercial/industrial fluorescent tube fittings, "Svelte," are announced by Briticent. Designs are strictly functional but neat and slim. The fittings have bi-pin holders and range from 2 ft 20 W to 8 ft 125 W batten-type and from 4 ft 40 W to 8 ft 125 W open-end and trough-type. They are constructed from rustproof steel, finished in high gloss white stove enamel. List prices are from £2 12s 6d 2 ft batten-type to £7 17s 6d 8 ft trough-type. "Svelte" fittings may be supplied with tapped control gear at 2s 6d extra or instant-start at 14s extra list. Delivery from stock. *British Central Electrical Co., 6-8 Rosebery Ave., E.C.1.*

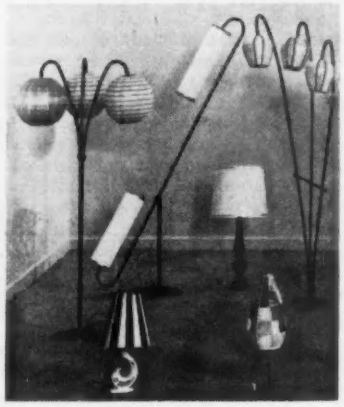
Air-conditioning unit

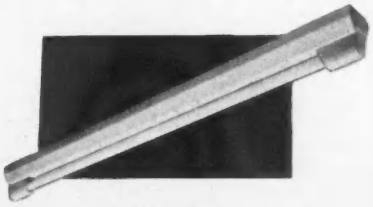
A NEW packaged air-conditioning unit for floor mounting is announced which utilises no outside intake. This unit, known as "Whispair," warms or cools air and delivers it into the room through a filter. It has automatic thermostatic control.

"Whispair" has a 2 kW heating unit and hermetically sealed compressor-type refrigeration system. Air is forced through a vertical nylon filter by two fans and passes into the room through diffusing louvres at the top of the front fascia. The filter is easily removed for cleaning. Careful attention has been paid to the elimination of noise from the unit. Sides of the cabinet are acoustically insulated and the use of two fans is said to reduce noise considerably. This conditioner has the advantage of being unobtrusive and compact. It stands 30 in. high by 33 in. wide and 10 in. deep. The entire front panel unclips to reveal all components. The unit has a maximum cooling capacity of 1,590 W. *Temperature Ltd., Fulham, S.W.6.*

Commercial radiant oven plate

GEC have launched what is claimed to be the first radiant hotplate for commercial ovens. It has two sheathed elements with a total 2¼ kW rating arranged to cover the same area as a 12 in. by 8 in. solid hotplate. Control is by a three-heat rotary switch. The plate is interchangeable with a GEC solid hotplate of identical size. Price £8. *General Electric Co., Magnet Hse, Kingsway, W.C.2.*

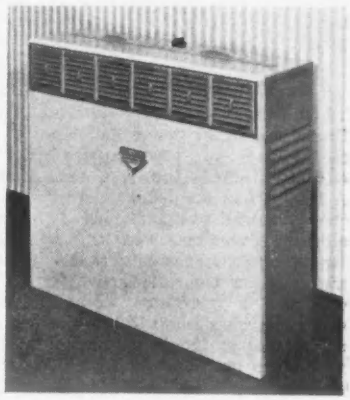




▲ *The new slim lined "Svelte" fluorescent fitting. 125 W, 8 ft trough-type is £7 17s 6d list*

The new "Whispair" floor standing air conditioner. It requires no outside air intake ▶

◀ *Some of the "Space Age" range of light fittings. Floor standards from left to right are Leo, £10 4s 9d; Virgo, £7 2s 8d; Aries, £9 6s 1d, tax paid. Table lamps are (left) Dolphus, £1 7s 11d; (back) Mars, £4 6s 10d, and (right), Coloroma, £1 7s 11d, tax paid*



News of the Week

APPLIANCES FROM N. IRELAND

B.S.R. Launching into New Sphere

A NEW domestic electric appliance concern is soon to be launched by Birmingham Sound Reproducers Ltd. Their well-known trade-mark for record changers "Monarch" will be utilised by a new subsidiary. Announcing this move, Dr D. McLean McDonald, chairman of BSR, said the name "Monarch Electric" is being acquired (Eveson Brothers (1928), who formed a firm of that name in 1940, have used the "Monarch" name for electric fires, washboilers, etc.) and a subsidiary of that name is being formed to make appliances. It is proposed that Monarch Electric Ltd. should establish a new organisation at BSR's existing Londonderry works, but this cannot be done other than by a complete shut-down while the new company starts its activities, Dr McDonald explained. It is hoped that the new concern will employ over 1,000 men within a few years, but at this stage no information is available on the specific appliances to be made there.

It has been known for some time that Birmingham Sound Reproducers Ltd. planned to develop other products for export, and were negotiating to manufacture compressor units for refrigerators, but the latter scheme has been held up by other difficulties. Just over a month ago a total of 980 BSR employees in Londonderry—230 of them women—were made redundant arising from a change in export market conditions. At the present time nearly 200 workers are employed at the Londonderry factory. There has also been local speculation over the purchase by Dr McDonald of several farms in County Donegal—a few miles over the Border from Londonderry.

Pye to make reactors

PYE are to make low-powered nuclear reactors for research and training purposes. A licensing agreement with the American Machine and Foundry Group to make and sell small reactors of the US company's design has just been concluded. Pye's move is timely, for the Government is currently considering applications for financial aid from British universities desiring reactors.

B.I.C.C. shifts plastics cable manufacture

BRITISH Insulated Callender's Cables Ltd. have decided to transfer the manufacture of plastics cable and associated products from Telcon Works, Greenwich, to other factories in the group. This is the latest move in the company's programme of concentrating manufacture into specialised units. By the end of 1961, production at Greenwich will be exclusively submarine cables and marine engineering products.

H.P. ups and downs to continue

THE Government is not prepared to consider making control of hire-purchase deposits and instalment periods a permanent feature of legislation. That was made clear by Mr N. Macpherson, Parliamentary Secretary, Board of Trade, in the House of Commons last week. He was answering questions reflecting industry's arguments that there should be some semi-permanent scheme to avoid violent changes in hire-purchase restrictions. The Parliamentary Secretary said that at present, removal of hire-purchase restrictions could be treated as a means of stimulating the economy and it would be undesirable to lose that facility.

Wholesalers Acquired

COZENS and Sutcliffe (Holdings) Ltd. have expanded their activities in the electrical field by the purchase of the electrical and radio wholesaling business of RJS Services Ltd., of Stoke-on-Trent. The company will continue as before, under its own name, with Mr H. V. Cozens as chairman of the new board, Mr H. A. Knight as managing director and Mr G. S. Heymer, who was previously domestic sales manager, becoming director and general manager. Cozens and Sutcliffe (Holdings) also control A. S. Duran and Co. Ltd., electrical wholesalers, of Reading, Southampton and Walton-on-Thames.

12 or 8-hour shifts?

TROUBLES over shift work hours at Brunswick Wharf power station are now the subject of consultation between officials of the unions and the CEGB. A majority of the 167 employees at the station wanted to operate 12-hour shifts, although the management and the District JIC rejected the plan as being contrary to the national agreement which stipulates a maximum of eight-hour shifts in such stations. But a number of men, ignoring the latter ruling, started their own unofficial 12-hour rota, and this has caused incidents.

Holme Pierrepont inquiry goes on

COAL supplies and air pollution were the main subjects discussed at the resumed public inquiry into the proposed Holme Pierrepont power station, at Nottingham last week. Mr G. England, CEGB development engineer, explained that if the station used 10,000,000 tons of coal, 180,000 tons of sulphur dioxide would be discharged into the atmosphere annually, and he expected it would fall about two miles from the station. It was proposed to install a £2·28 million gas-cleaning plant having a 99·3% efficiency. Mr G. Guest, for Nottingham Corporation, suggested the latter figure was a gross exaggeration, but Mr England denied this.

Answering Mr D. Cowley, representing West Bridgford Council, Mr England agreed that, regrettably, the station would increase air pollution in the locality—it was inevitable—and he added that grit emission would be 9,800 tons a year, much of which would probably fall in Nottingham.

Earlier, when the inquiry was reopened, Mr Cowley said the refusal of the CEGB to reveal figures of coal output and coal transport costs and the refusal to give details of contracts made between the Board, the NCB and the British Transport Commission, gave rise to the greatest suspicion.

For the CEGB, Mr S. R. B. Cooke, Q.C., offered to make the figures of coal output and transport costs available to a mutually responsible and independent third party.

Mr H. W. Grimmitt, a member of the three-man inquiry panel, considered that a satisfactory way out, for there seemed to be immense complications at the arrival of the figure of £600,000 for coal costs for the station, and he was sorry the Board could not find a simpler way of presenting their case than by rather complicated computer calculations.

Subsequently, when other figures were quoted from an article by a Coal Board official, Mr Grimmitt said he was sure two such responsible bodies as the CEGB and the East Midlands Coal Board would not entertain the spending of money on a power station and then find they did not have enough coal to supply it after 1968.

At Friday's hearing, Mr H. Lawson, deputy engineer to Nottingham Corporation, suggested that the flatlands along the Trent between Newark and Gainsborough would be a more suitable site from the amenity point of view.

The inquiry was adjourned until today, Thursday, and the site was inspected this week.

DIESEL ECONOMIES QUESTIONED

EXPERIENCE with diesel-electric locomotives in America has not confirmed expectations that they would make a large saving compared with steam locomotives. This was claimed by Mr H. F. Brown, an American consulting engineer, in a paper he presented to the Institution of Mechanical Engineers in London last week.

Reflecting that the question of steam versus diesel has been regarded as a closed issue in the USA since 1950, Mr Brown says that nothing can be found in recent American cost figures to justify the claim often made that diesels are producing a 30% return on their investment.

In his paper, Mr Brown is concerned with diesel locomotives not with electric locomotives. He says expectations of savings were based on experience with relatively few diesel engines in the period 1935-46. Long-term experience has suggested many modifications.

For example, "evidence is now well established showing that the diesel locomotive has about half the service life of a steam or electric locomotive in the same service."

Although diesel engines have excellent performance in terms of tractive force at low speed, single diesel units cannot produce the horsepower required for high speed to the same extent as modern steam or electric locomotives. Further, as more and more diesel engines have come into service, it has become clear that more diesels are required for a given level of train service than steam locomotives for the equivalent service.

Another claim often made for the diesel, that it reduces cost of track maintenance, is also contradicted by Mr Brown. His conclusion is that the diesel locomotive has not revolutionised American railway economics; in main line uses it has added to the financial burden of the railways.

In the discussion on the paper there was no lack of disagreement with Mr Brown's conclusion, which he emphasised were not advanced to support any one type of particular railway motive power.

In an interview given to *The Times* after reading his paper, Mr Brown is quoted as saying that electric traction was the right choice for modernisation of lines such as London-Crewe-Liverpool.

He said that the railway for which he had previously worked in the USA had been recommended to change as rapidly as possible from diesel traction to electrification. Mr Brown's theme seemed to be "don't modernise too fast; allow steam locomotives to wear out before replacing them." He praised British diesel-electric locomotives.

New Home Centre

LONDONERS with housekeeping problems will be able to turn to a new source of relief from 3 Jan., when AEI-Hotpoint will open a permanent Home Centre in Oxford St. The Centre will answer queries on all aspects of housecraft, as well as demonstrating the full range of Hotpoint domestic appliances. Facilities will include a lecture theatre.

Attracting electricians from Eire

ELECTRICIANS are being enticed away from Eire to work on nuclear power station sites in England at higher wages, it is alleged. The exodus has caused an acute shortage of skilled electricians in Dublin, and electrical contractors there are having difficulty in carrying out their work with depleted staffs. The main attraction to the men, it seems, is the offer of many hours of overtime, including Sundays.

E.E.—G.E.C. merger off

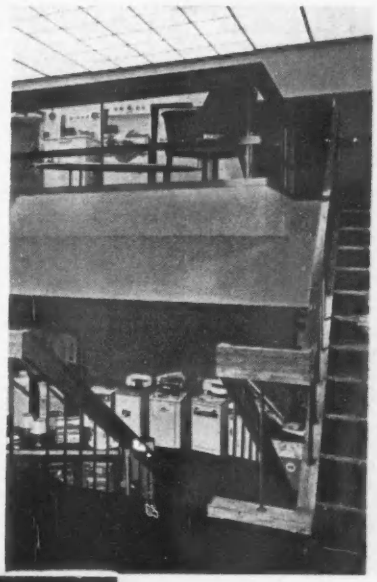
THE proposed GEC-English Electric merger is off. The brief announcement by the boards of both concerns last week simply stated that they had been unable to bring to a successful conclusion their discussions on the merger, and the negotiations had accordingly been discontinued. It was on 27 Sept. that the surprise announcement was made that there were to be discussions on the possibility of forming a holding company. Earlier there had been several rumours linking GEC with other concerns in such talks.

RAILWAY FUTURE

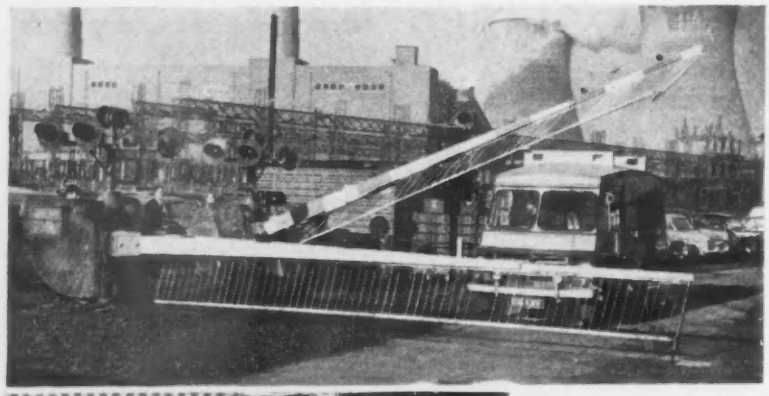
WHEN the British Transport Commission forwards their long-heralded proposals for a revision of their modernisation plan to the Ministry of Transport, the document will take the form of a new four-year programme. Saying this in the House of Lords last week the Joint Parliamentary Secretary, Ministry of Transport, repeated the Government's refusal to publish the report of the group under Sir Ivan Stedeford's chairmanship, which has been advising the Minister. It was emphasised that the group have produced recommendations, but have not made a report. Recommendations by the group had always been intended to be confidential to the Government and the BTC.

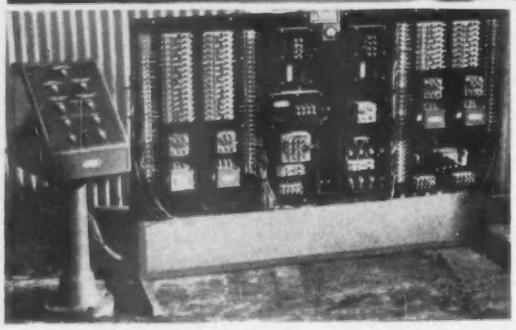
IMAGINATIVE CENTRE AT LINCOLN

LINCOLN'S long wait for a worthy service centre has been rewarded with quarters which would be hard to beat for facilities and design. At street level, the new centre presents a modern glass front showing display areas on three levels, with communicating stairways between the upper, lower and promenade decks. Above the ground floor, the "perpendicular" façade of the 60-year-old building has not been altered, resulting in an imaginative blend of old and new. East Midlands EB's coat of arms, in an illuminated ply-glass panel, and a blue neon sign announcing simply "Electricity" decorate the front. Facilities of the centre include a demonstration room, a conference room, and even a greenhouse on a flat roof at the rear to show methods of soil warming, propagating plants, and ventilation. Quite apart from the electrical appliances in the showroom, the uses of electricity are well illustrated by the centre's elaborate lighting and 35 kW under-floor heating in the various sales areas.



The three separate sales floors at the new Lincoln service centre of the East Midlands Electricity Board are clearly shown in the view above. The demonstration theatre and conference room, left, has infra-red lamps on the sloping section of the battens, with tungsten lighting on the flat section





The new lifting barriers which are to be installed at South Farm level crossing, Worthing, are seen above. A van driven straight at the barriers shows how they can be crashed without damage. The boom is made up of two laminated spruce beams. On the left is the push-button equipment which controls the quick-acting barriers

Barriers to replace crossing gates

RAILWAY crossing gates as we know them are almost entirely confined to British railways. Both in America and on the Continent boom-type barriers, raised and lowered either by hand or powered, have been in almost exclusive use since the earliest days. Now, it seems, the crossing gate is to follow the steam engine into history.

Work is already in hand to replace the gates at Worthing Central, on the Southern Region, by electrically operated barriers designed and manufactured by Rotax Ltd., and 24 to 30 more are planned for installation at other crossings in the next 18 months. The twin spruce, balanced barriers are raised or lowered by battery-operated motors under the control of the signalman at a push-button control column. The operation is accompanied by the sounding of alarm bells and by flashing lights, which can be seen both by day and night, at some distance from the crossing. Either gate can be "crashed" by a road vehicle without damage to the vehicle and with no more than a sheared pivot pin, easily replaceable, on the barrier column. Warning is given to the signalman in the event of non-operation or damage.

Nuclear Research for the Universities

PROGRESS with the National Institute for Research in Nuclear Science up to 31 March last is reviewed in the Institute's third annual report published recently. Object of the Institute is to provide facilities for universities in the form of high-cost nuclear plant. At present it has one machine working at its Rutherford High Energy Laboratory, Harwell, a 50 MeV proton linear accelerator.

Also at the Rutherford laboratory, the Institute is building a 7,000 MeV proton synchrotron "NIMROD," a major electromagnetic particle accelerating machine scheduled for completion in 1962.

Amongst the Institute's tasks is preparation of a programme recommending what nuclear reactors should be provided for universities and whether they should be built. In this respect it is to advise the Government.

This aspect of the Institute's work was the subject of a Parliamentary question last week, concerning delays on the part of the Minister of Science in deciding whether Imperial College, London University, should be permitted to build a low-power nuclear reactor. It was pointed out that cost of the reactor might be up to £250,000. The Minister of Science's policy was to look at overall requests from all universities. (For outstanding requests, see ELECTRICAL TIMES, 1 Dec., p. 859.)

OFFICIAL PUBLICATIONS

Utilisation Research Report No. 16. Comparative tests on heating school buildings by electric thermal block storage heaters and other methods. Electricity Council (see page 876).

National Institute for Research in Nuclear Science. 1959-60 Report (see page 898).

BS 1853. Tubular fluorescent lamps for general lighting service. 7s 6d.

BS 3288. Insulator and conductor fittings for overhead power lines: Part I, performance and general requirements. 5s.

BS 3287. Domestic electric clothes washing machines. 6s.

N.C.B. Specification 210. 300 A medium-voltage flameproof air-break circuit-breaker. 1s.

REFRIGERATOR DEMAND LOW

HOME demand for refrigerators recovered slightly in October from September's poor showing, but was still 43% below October last year. Figures released by the Domestic Refrigeration Development Committee show that British manufacturers delivered 32,057 refrigerators to the home market in October, against 27,248 in the previous month. Exports continued to be bright, totalling 7,974 refrigerators for October—23% higher than a year earlier.

Electrical Industries Census

ELECTRICAL engineering was Britain's fourth largest manufacturing industry in 1959, according to a Board of Trade census. Sales and work done by all electrical engineering firms for the year totalled £1,462·9 million, exceeded only by the food industries, mechanical engineering and chemical manufacturing. Capital expenditure by the industry rose by about £1·4 million in the year to £56·7 million, due to increased outlay on plant and vehicles.

Unofficial Shop-stewards Ending?

SECRETARY of the unofficial shop-stewards Committee in the Electrical Supply Industry which threatened a strike in power stations earlier this year, Mr G. Wake is to resign from that position. This follows his meeting earlier this week with officials of the Amalgamated Engineering Union, of which he is a member.

Line from Sizewell

DESPITE objections by some members, East Suffolk County Planning Committee have approved a CEGB plan to re-route the proposed transmission line from Sizewell nuclear power station. Instead of the previously proposed westerly line across the county, the new route will be south-westerly, skirting the northern fringe of Ipswich and crossing into West Suffolk parallel with existing overhead cables from Cliff Quay. Certain members maintained that the lines would create a hideous sight near Ipswich, but the Committee chairman and Lord Cranbrook argued that the re-routing had to be planned on a national basis, and if the proposal was acceptable to other counties involved, they should make as little alteration as possible.

Industry Leaders on Commonwealth Trade

SIR WILLIAM McFADZEAN, chairman and managing director, BICC, and president of the FBI, and Lord Chandos, chairman, AEI, were members of a panel which dealt with questions on Commonwealth trade at a meeting organised in London last week. Sir William gave his view that imperial preference had been diminishing in value during recent years and should be the subject of a realistic reassessment because it was proving an obstacle to European union.

He said formation of the Export Council for Europe, of which he was chairman, ought to assist Commonwealth trade, particularly as it would help to increase the demand for raw materials.

Speaking about credit for exporters, Lord Chandos said it was impossible for the UK to compete with some other countries on length of export credits without running into serious balance of payments troubles. Sir William declared that the UK had to try to avoid any credit race, though he thought the Government could go further than at present in granting credits for selected projects. An example would be a single big and profitable capital programme. He was against tax incentives for exporting companies and he thought paper work could be made simpler to help the smaller exporter, who had to be encouraged to join with larger firms in developing the export market.

Both Lord Chandos and Sir William agreed that no obstacles should be placed in the way of countries with capital surpluses investing in Commonwealth countries.

TARIFF CUTS FORECAST FOR SOUTH OF SCOTLAND

REDUCTIONS in off-peak tariffs were forecast last week by Mr W. Hutton, deputy chairman of the South of Scotland EB. He said this was despite the two reductions made since off-peak tariffs were introduced only five years ago. Continual improvement in generating efficiency made this possible. When the second section of Kincardine power station and the Hunterston nuclear station came into operation, production costs would go even lower.

Mr Hutton was speaking at the opening of an all-electric hotel and catering exhibition in Ayr. This showed a variety of appliances designed to meet the needs of those who run hotels, boarding houses and canteens.

Reinforcement in Scotland

SCHEMES costing more than £400,000 have been approved by the South of Scotland EB to improve electricity supply in the Linlithgow, Saltcoats and Alloa areas. Two substations are involved in the work, planned to be completed by 1962. At Saltcoats two 60 MVA, 132/33 kV transformers will replace a 30 MVA unit and a 33 kV line erected to Kilbirnie. A new substation will be erected at Manuel to take supplies from the Grangemouth grid.

Reorganisation in Parkinson Cowan

PARKINSON COWAN LTD. have merged two operating divisions in order to streamline marketing. Production of metering and automatic control equipment, hydraulic pumps and remote control and telemetering equipment, formerly divided between Parkinson Cowan Instruments, and Measurement Ltd., will now be controlled by Parkinson Cowan Measurement. The new division will be headed by Mr C. H. Chambers, previously divisional manager of Parkinson Cowan Instruments.

COSTING NUCLEAR POWER

PUBLICATION of a manual on costing out nuclear power projects is promised by the International Atomic Energy Agency for early in 1961. A panel of expert advisers representing nuclear energy authorities in many countries has been working on this, with the aim of helping underdeveloped countries. The Agency feels guidance on the subject to be necessary in view of its complexity, and the wide variations in assumptions and methods used in industrialised countries for estimating nuclear power costs, and so in making price quotations for nuclear power plants. It is hoped that the book will help potential customers apply to their own circumstances the cost figures available from experience of other countries.

The British members of the panel are Mr J. Gillams of the UKAEA, while Mr J. E. Shallcross of the UKAEA is acting as its consultant.

Contracting Consortium

A PROMINENT electrical contractor is one of 11 sub-contractors forming a new group under the title Consortium Contractors and Engineers Ltd. with a nominal capital of £12,000, which is being set up to undertake, in addition to their normal functions, large-scale all-trades work in commercial buildings. The consortium will be able to call upon members specialists ranging from demolition work, steel fabrication to heating and ventilation.

F. W. Blanshard Ltd., the Purley contractors, who were responsible for the London Planetarium installation, represent the electrical industry, and Mr F. W. Blanshard is joint executive director of the new organisation which has offices at 166 St. Stephens Hse, S.W.1.

Faraday substation

THE LCC and other authorities have abandoned the idea of encasing the substation to be built on Elephant and Castle roundabout in glass because such an area of glass was considered to be too vulnerable. Other methods of showing the apparatus have failed, and the substation will now be housed in strictly functional stainless steel, with an aluminium roof. However, it is still proposed to erect a memorial sculpture on the site to Michael Faraday, who was born in the vicinity. Negotiations between the LCC and the Southwark Metropolitan Borough Council are still proceeding on the question of public access to the central island and the siting of the memorial.

Another H.P. Loss

A SERIOUS loss from bad debts has been reported by yet another hire-purchase trader—this time Easterns Ltd., the 22-store furniture and appliance chain based on London. Provision of £300,000 to cover bad debts on household equipment incurred by H.P. subsidiaries has resulted in a group loss of £230,900 for the year to August.

No. 1 reactor building is beginning to take shape at the 500 MW Trawsfynydd nuclear power station being built for the CEGB by Atomic Power Constructions Ltd. The first reactor at the station is due for commissioning in 1963

I.H.V.E. plans for international conference

PLANS for a joint international conference on heating, ventilating and air conditioning and an associated exhibition of equipment were discussed at a recent meeting of a group of contractors and manufacturers in the heating and ventilating industry, and representatives of the Institution of Heating and Ventilating Engineers and other official bodies.

The IHVE is sponsoring the exhibition, but has no financial responsibility for it. However, the Institution feels everyone would benefit if the conference, scheduled for 27 Sept., 1961, was held at the same time as the exhibition and at the same venue, Olympia.

The IHVE has devoted the sum of £1,000 towards expenses of organising the conference, and has made an appeal to manufacturers, contractors and other interested bodies to provide working capital in the form of an interest-free loan, half of which is to form a guarantee against losses. There is concern that the standard of entertainment of distinguished guests, particularly those from abroad, should be at a high level.

The meeting resulted in over half the loans and guarantees required being promised. According to the Institution, the conference and exhibition now have sufficient financial support to ensure success. However, further contributions would be welcomed from firms or individuals in the form of an interest-free loan for one year, or a donation for special hospitality. Chairman of the conference co-ordinating and management committee is Mr J. R. Paterson, of G. N. Haden and Sons Ltd.

Providing cookers for tenants

FACED with the likelihood of replacing electric cookers in pre-war Council houses, East Kesteven Rural Council are seeking low quotations. They have already had an offer from the local district manager of the East Midlands Electricity Board who has offered Jackson cookers at £27 4s net, or in a quantity of £250 worth at £26 10s each, but the Council's technical sub-committee has instructed the clerk to the Council to seek a larger discount or negotiate with other suppliers.

The surveyor had earlier reported in respect of the provision of 390 electric cookers in the houses. Of these, 15 were provided by the Council, 181 were hired by the tenants from the EMEB, 37 were owned by the tenants, 69 tenants did not have an electric cooker, 40 tenants provided their own small cookers, and 47 tenants had their own gas cookers.

Farms use more electricity

FASTEST growth in the use of electricity occurred on farms in the three months to 30 Sept., when compared with the corresponding period of 1959. Latest figures from the Electricity Council, set out below, suggest an increased use of electricity for grain drying because of the wet summer and continuing rural electrification. All groups used more electricity in the latest quarter than a year earlier, and for the 12 months as a whole, but total sales for the latest three months are down compared with 23,294·9 million units sold in the previous quarter. This seasonal decline was spread over all groups except public lighting and traction. The figures, covering England and Wales only, refer to units metered or billed during the period.

Type of Consumer	3 months ended		12 months ended	
	30 Sept. 1960	% gain over last year	30 Sept. 1960	% gain over last year
Domestic ...	5,807·3	+16·0	28,773·6	+12·5
Farm ...	348·4	+18·1	1,612·7	+ 5·6
Commercial ...	2,111·4	+15·9	11,186·6	+11·0
Combined Domestic/ Commercial	304·5	+12·8	1,466·6	+10·9
Industrial ...	10,628·4	+12·1	45,330·7	+13·0
Public Lighting	161·3	+ 8·8	751·4	+ 8·1
Traction ...	385·4	+ 2·7	1,565·8	+13·1
Total ...	19,746·7	+13·5	90,687·4	+12.2

Calder Hall model at exhibition

EVER wanted to try your skill with remote control devices of the type used for handling radioactive materials? You will have the opportunity at an exhibition on the peaceful uses of atomic energy being staged by Ilford Ltd. in London, from 14 Dec. to mid-February. Mainly photographic, the exhibition will include photographs from the UK Atomic Energy Authority's library, with a section on electricity from the atom. The exhibition is at Ilford Hse, 133-35 Oxford St, W.1.

Opposition to new wage plan for Engineers

DISSATISFIED because the committee set up 14 years ago by the Engineering and Allied Employers' National Federation to evolve a new wage structure for the industry, had met strong opposition, Dr J. J. Gracie, of the General Electric Ltd., has resigned from the chairmanship of that committee. It seems that the opposition to the proposed scheme came from a minority on the committee but that minority was a strong one. Dr Gracie has said that the committee had met many times to consider the difficult and complicated problem, and a completely new approach was now under consideration. This scheme may be considered at the meeting of the Federation's management board on 21 Dec.

It is understood that the proposals supported by Dr Gracie and a majority of the committee, suggested that time and piece rates for skilled workers should be the only subjects of national negotiations; the labourer's rate would be a fixed proportion of the skilled rate; and individual firms would adjust the piece rates and grading of semi-skilled workers.

Opponents of this plan consider the present method of negotiating rates quite adequate.

More Pay for Engineers

ENGINEERS, particularly younger members of the profession, have substantially improved their relative position in the community, in terms of salaries, during the last four years. That is the conclusion of the Engineers' Guild on the basis of a survey of salaries during the financial year 1959-60, preliminary results of which are published this week.

Comparative figures are taken from the survey for 1955-56 prepared for the Royal Commission on Doctors' and Dentists' remuneration, which collected information on earnings in several professions.

Full results of the survey are promised next month; meanwhile the accompanying table shows figures for all types of professional engineers combined.

Professional Engineers' Earnings, 1955-56 and 1959-60

Age Groups	Lower Quartile £'s		Median £'s		Upper Quartile £'s	
	1959-60	1955-56	1959-60	1955-56	1959-60	1955-56
Under 35	1,145	837	1,316	953	1,540	1,110
35–39	1,292	965	1,501	1,142	1,789	1,376
40–44	1,365	1,040	1,632	1,281	2,115	1,659
45–54	1,419	1,150	1,778	1,484	2,474	2,000
55–64	1,620	1,216	2,048	1,652	2,977	2,305
All ages	1,304	950	1,574	1,181	2,042	1,600

One-quarter of the "sample" earn less than the lower quartile figure, one-quarter more than the upper quartile

NEW CABLE SHIP

CABLE AND WIRELESS LTD. are to have their own cable-laying ship. A number of British shipyards have been invited to tender for the building of an 8,000-ton ship for delivery in 1962. The company's present fleet, and the 4,000 ton *Retriever*, nearing completion at Birkenhead, are all repair ships capable of carrying up to 400 miles of cable only. For long distance cable laying, Cable and Wireless have in the past chartered ships, mainly from the Post Office. The new cable layer will have a capacity of 1,200 miles of lightweight telephone cable with repeaters, and a steaming range of 8,000 miles. She should be available for the trans-Pacific stage of the 28,000-mile Commonwealth round-the-world telephone cable.

Switch selling again

SWITCH selling was once more the subject of questions in the House of Commons last week. Five MP's tabled questions to the President of the Board of Trade about alleged abuses in this field, particularly the advertising aspect. The Government's reply indicates that there are to be discussions with the Newspaper Proprietors' Association and the Periodical Proprietors' Association, which made recommendations to their members about the kind of advertisements that papers should accept. The President of the Board of Trade is not willing to consider legislation to control door-to-door salesmen in the switch selling field until he has received the report of the Molony Committee on Consumer Protection reviewing some aspects of hire-purchase trading.

Winter Power Shortage?

STORIES in the daily Press about the possibility of a power shortage this winter are likely to prove exaggerated, examination of the available statistics shows. The fear of shortage is based on the high rate of increase of sales of electricity recently, 15·8% higher in Oct. last than in Oct., 1959. Relatively bad weather accounts for part of the difference, but even after allowing for this, the increase is estimated at 13·4%, about double the accepted "planning" increase. However, in recent weeks, electricity generated has been running at the more normal rate of increase of 11% above 1959 figures, before correcting for the inclement weather.

The Electricity Council has said that if the recent trend in load growth were to continue, and there was particularly bad weather in the new year, then maintenance of normal voltage and frequency might prove difficult to achieve.

Sayings OF THE WEEK

"Last week, rain water gathered in the angels' tummies so that they all looked pregnant. We had a man going along the street with a spike on the end of a long pole puncturing them." . . . MR BEVERLEY PICK, designer, on the illuminations in Regent St, London.

"Over half the boys now going into industry, and a much higher proportion of the girls, are given no planned training of any kind." . . . LORD MCCORQUODALE, president, British Employers' Federation, at conference on industrial training.

"I can find nothing to say about the Electricity Supply Industry except that, quite simply, in running the CEGB our object is to make it as nearly as possible like the best privately owned industries but rather better." . . . SIR CHRISTOPHER HINTON, at the Chartered Institute of Secretaries' annual dinner.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, December 6

	£ per ton	Weekly change £
COPPER, standard class A (settlement)	235½	+4
" (3 months)	231½	+3
LEAD, refined pig, 99·97% purity (cash)	66½	−¾
" (3 months)	67¼	—
TIN, refined, min. 99·75% purity (settlement)	799	—
" (3 months)	797	—
ALUMINIUM, ingots 99·99·5%	186	—
" wire bars (4 × 4 × 54")	193½	—
BRASS Strip 63/37	204½	—
SILVER (Troy oz)	79½d	—

	£ per ton	Weekly change £
ZINC, virgin, min. 98% purity (cash)	86½	−½
" (3 months)	86	−½
RUBBER, per lb		
No. 1, RSS, spot	24½d	−⅛d
c.i.f. basis, ports, Feb.	25d	−¼d
ARMOURING:		
Galv. Steel Wire (0·104 in.)	68	—
Mild Steel Tape (0·04 × 1½ in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	70½	—
AMERICAN PRICES:		
Copper, electrolytic (per lb)	30c	—
Lead, (New York)	12c	—

* *Tape Price, now an average, includes varnishing*

ELECTRICITY IN DEPARTMENT STORES

ADVICE on points to watch in designing electrical installations in departmental stores is given in the October number of *FPA Journal*, published by the Fire Protection Association. Five points are made:

1. Lamps should be clear of displayed goods, decorations and other materials.
2. Circuits should be arranged so that all except essential equipment can be easily switched off from the main controls when the department store is closed.
3. Every fault should be dealt with as it is discovered.
4. All wiring and equipment should be inspected and tested regularly at frequent intervals.
5. All repairs, alterations and additions, such as temporary lighting for window displays and Christmas decorations, should be carried out by qualified electricians, preferably those NICEIC approved.

RECENT ORDERS

AN order for 900 550 W, 24 V, portable, petrol-driven generating sets has been awarded to A. C. Morrison (Engineers) Ltd. by the GPO.

The British Transport Commission, on behalf of British Railways, Southern Region, have awarded a large railway signalling contract to the AEI-GRS Ltd. It covers the Serington-Dover section of the Kent coast lines—some 20 miles of track.

Synchronous and squirrel-cage induction motors worth over £100,000, for a new oxygen tonnage plant in New South Wales, have been ordered from the Heavy Plant Division of AEI Ltd.

ORDERS EDGE HIGHER

NEW orders received by industries producing engineering and electrical goods during September were the second highest this year and about 2% higher than in September, 1959. Orders on hand edged up slightly during the month, outpacing the seasonal rise in deliveries after the holiday season. Export orders and deliveries showed a similar trend, although electrical machinery and appliances are believed not to have contributed their full share. Latest figures available from the Board of Trade for electrical engineering production show a slight decline from May to June, though output was still about 4% higher than a year earlier.

Stockton Works to Close

THE locomotive works of Metropolitan-Vickers-Beyer Peacock, Stockton-on-Tees, will close in February because of lack of orders. This was announced to the 324 employees on Monday, but it was explained that the management would co-operate with any other engineering firm which may want to take over the factory. This news, given officially, follows recent rumours concerning the future of the Stockton works, which we earlier reported.

News in Brief

The EIBA has received £3,800 from the Electrical Industries' 1960 National Golf Championship—£150 more than ever before.

Lec Refrigeration Ltd. have given notice to nearly 100 employees at their Bognor Regis factory.

Some 200 customers and friends were entertained by Arrow Electric Switches to a cocktail party at the Rembrandt Hotel, S.W.7, on 30 Nov.

The North Eastern Electricity Board's redesigned service centre at Stockton was officially opened last week by Ald J. S. Darby, Mayor of Stockton.

In view of the success of its predecessor, the second annual Electrical Engineers' Exhibition dinner will be held on 28 Sept., 1961, again at Grosvenor Hse.

AEI-Hotpoint recently dispatched by special trains an export order for 3,000 washing machines and refrigerators.

The nation's hire-purchase debt continued to tail off in October, falling £7 million to £945 million. Retail sales as a whole maintained the same level as in September but durable goods sales were still 12% lower than a year earlier.

Company Activities

A DISTINGUISHED week! Distinguished by the fact that the snowballing news of economic ill-omen was able last week to thump the *Financial Times* index of industrial Ordinary shares to a new 1960 "low" of 295·2—a fall of no less than 8·4 points on the previous market day. Press comment on the troubled state of the economy can be held largely to blame here in that it triggered off widespread selling. But although numerous, individual sales were not large and with some institutional support at these lower levels the market made a smartish recovery to 302·3 by mid-week. Indeed, had it not been for the element of confusion introduced by the "off-on" uncertainty over the US Ford bid for UK Ford the market would undoubtedly have finished the week higher than 300·5. For it has been the prospect of some £80 million of new money flowing into the market, especially equity sections, which has been a strong underpinning factor in stock market sentiment these past few weeks.

Meanwhile, the immediate outlook for most electrical shares, although not particularly bright, could be enhanced by the appearance of cheap buyers particularly with longer term investment in mind. Last week certainly gave a mixed bag of electrical price movements. The 7% yield now offered by AEI was enough to keep its shares at a level 41s 6d, but EMI went through to a new "low" of 40s 6d after starting out the week at 42s 9d. Plessey also dropped 2s 3d to 44s, and Dimplex after its recent run eased from 47s to 43s 9d at one time before rallying to 45s 6d. Decca Record, too, tumbled 2s 9d to 49s 9d. On the other hand, International Computers and Tabulators after slipping from 61s 9d to 58s 9d climbed back to finish the week 1s higher at 62s 9d, and Pye, recovering from its new "low" of 12s 9d closed at 13s 7½d. E. K. Cole came in for some support and were wanted 1s 3d dearer at 19s 10½d. Compared with an equivalent price of 30s at the start of the market week, Birmingham Sound Reproducer's 5s Ordinary shares, ex the one-for-two free scrip issue, and on the news that a "Monarch Electric" subsidiary is being formed to make domestic appliances in Londonderry, advanced 1s to 31s.

But without any doubt, the biggest news for the electrical market was the announcement that the English Electric and GEC merger talks had been called off. These talks which started in September had envisaged a holding company with total assets of some £177 million. Although the mind boggled at the immensity of the merger, it none the less seemed a "natural."

Since the time it was made known that merger talks were on the £1 Ordinary shares of both have tended to run together. Both opened last week at 31s 9d and both touched new 1960 "lows" the following day—English Electric at 30s 9d and GEC at 30s 6d—before recovering to 31s 9d and 31s 3d, respectively. Then, on the "talks-off" surprise, down dropped GEC to 29s 3d but up jumped EE to 33s! The market's verdict on the breakdown, then, has been that English Electric have secured a thankful release. Any investor tossing now the coin as to which he should back here should also remember that GEC, now at 31s, are 16s 6d down from their 1960 "high" but that EE at 32s 6d could be better positioned for recovery, 20s 6d back from their peak price.—*From our City Correspondent.*

British Electric Resistance Co.

Working to small profit margins and relying on a continuously expanding circle of customers, bringing a correspondingly larger order book, this concern moved up the trading results once again. The Ponders End factories have been operating to full capacity with the labour force available, and to meet the growing demand a lease has been taken on a newly built factory at Potters Bar, where production has just started. Mr H. Paul-Huhne, the chairman, reports. Although, in total, the company's export figures are up on previous years, difficulties are still being experienced in certain overseas markets, notably in India (where a new manufacturing arrangement is in process), South Africa and Canada. Excellent progress has been made in Australia and exports to Europe continue to show an upward trend.

Year to 31 July	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1956	73,128	22,255	39	20	4/9	3/6
1957	84,779	25,335	44	20	4/10	4/1
1958	86,138	25,793	45	20*	4/10	2/11
1959	85,053	32,619	35	15	6/10	4/1
1960	100,605	39,167	35	17½	10/6	5/6

* Plus 50% capital bonus.

Efco Ltd.

A one-for-one scrip issue is announced by the directors, along with an interim dividend of 7% (5%). In the first six months of the current year, orders have been substantially higher than in the corresponding period of last year, Mr Donald F. Campbell, the chairman, reports. Provided nothing unforeseen occurs, the amount paid as dividend in respect of 1960-61 will not be lower than last year's payment of 20%—equal to 10% on the proposed increased capital.

Garrard Engineering and Manufacturing Co.

The offer by the Plessey Co. to acquire the Ordinary and Preferred Ordinary shares not already owned in this concern has been accepted in respect of over 90% of both classes, it is stated. The offer thus becomes unconditional.

Haffenden-Richborough Ltd.

Application has been made to the London Stock Exchange for a quotation for the 750,000 4s "A" Ordinary shares in this concern which has been newly formed to head a group of firms, one of which, W. W. Haffenden Ltd., is already well known in our industry for its rubber plugs. The other concerns involved are: Richborough Rubber Works Ltd. and Sandwich Engineering Co. The group's profits for 1959, subject to directors' emoluments and taxation, amounted to £146,959 and for the six months to June, 1960, to £98,698, it is stated. Having regard to current trading conditions it is expected that profits for 1960 will be a least £180,000. Issued capital is £150,000 in "A" and £150,000 in 4s "B" Ordinary shares, and dealings in the former are expected to start on Monday.

London Aluminium Co. Ltd.

The directors are holding up further consideration of the rights issue forecast last June until they are in a position to fully assess the impact of the transfer from Witton Wks to Wombourn and future financial requirements. The associated company, Midland Aluminium, recently acquired a 20-acre site at Wombourn, to where plant and machinery is to be moved from Witton. Major Dibben, chairman, points out that although there is an increase in the profits to date, the transfer is bound to cause some temporary dislocation of production during the last few weeks of this year and the early part of next year, which will be reflected in temporarily reduced profits. Profits for the nine months of 1960 show an improvement.

Richardsons, Westgarth and Co.

Trading since March, 1960, has been at a lower profit than in the previous year, as earlier forecast, the directors state. Shortage of work and extremely competitive conditions continue and, in the circumstances, the board has decided to make no payment of an interim dividend. It is hoped to make a reduced distribution when the results for the full year ending 1 April, 1961, are available. Last year an interim payment of 4d/10s share was followed by a final of 6d.

Dividends Declared

Bakelite Ltd. Interim 6% (*5% equivalent*).

Johnson Matthey and Co. Interim 3% (*same*).

B. S. and W. Whiteley. Interim 10% (*8⅓% equivalent*).

TUBULAR STEEL LIGHTING COLUMNS FOR BIRMINGHAM'S INNER RING ROAD

S&L

All our standard columns are now supplied with the new plain slip-in door.

Planning for the safety of motorist and pedestrian after dark has become a matter of ever increasing importance. The Inner Ring Road in Birmingham is a typical example of how this problem is being tackled.

For the project, planned by the City Engineer and Surveyor, Sir Herbert J. Manzoni, C.B.E., S & L supplied tubular steel lighting columns which were specially designed to provide a mounting height of 30 ft.

The columns are fitted with 4 ft. 6 in. diameter post-top lanterns each with three Osram 400 watt colour corrected mercury lamps. The lanterns were developed and manufactured by the Lighting Division of the G.E.C.

S & L are supplying a total of 2,500 tubular steel columns of a different design for other lighting projects in the Birmingham area.

STEWARTS AND LLOYDS LIMITED

Tubemakers for a Century

GLASGOW · BIRMINGHAM · LONDON

MEM introduce a new range of 500 volt SWITCHGEAR

CHROME PLATED FRONT OPERATING SWITCH HANDLES

FABRICATED STEEL ENCLOSURES

SEMI-ENCLOSED REWIRABLE OR H.R.C. CARTRIDGE FUSES

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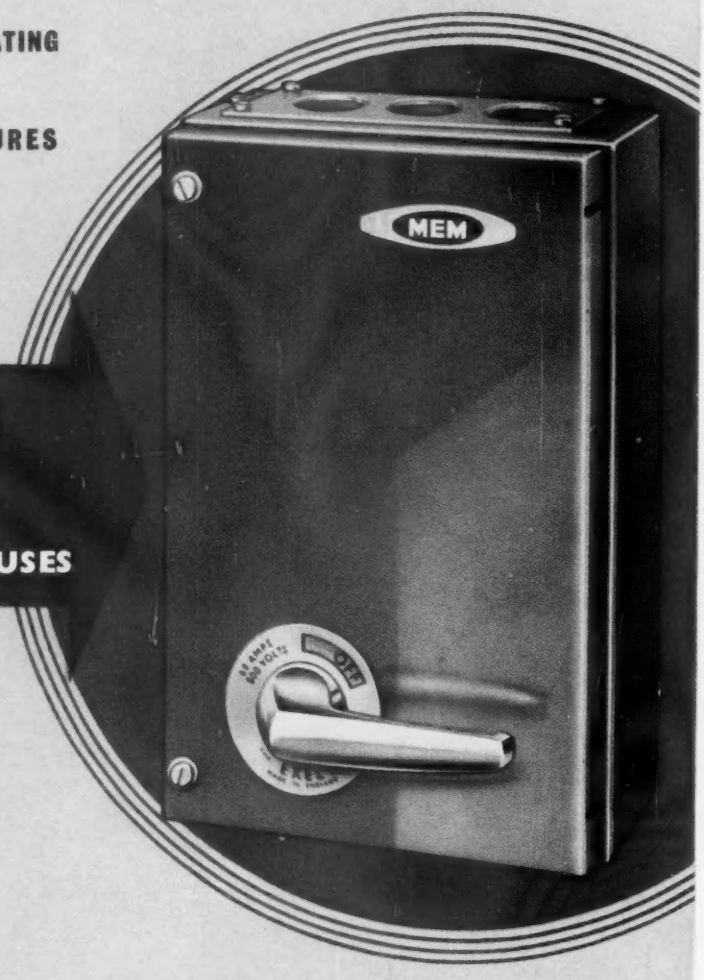


'EXEL'

SWITCHES AND SWITCHFUSES

- Fabricated cases are of heavy gauge sheet steel with hinged covers, rustproofed and finished grey stove enamel.
- The "Exel" range is fitted with chrome plated front operating switch handles, a feature which permits more compact assemblies on switchboards or panels.
- The "ON" and "OFF" positions are clearly shown by an indicator associated with the switch handle.
- Fuse bases are of the new "Kantark-Exel" pattern, which will accept semi-enclosed rewirable or H.R.C. cartridge fuse carriers.
- M.E.M. H.R.C. cartridge fuse carriers are designed to accommodate H.R.C. cartridge fuse-links to B.S.88:1952, Appendix 'J' Dimensions, Form A—Offset Tags.
- M.E.M. H.R.C. cartridge fuse-links are available for use with this range of switchgear, and have been A.S.T.A. certified for Category of Duty 440 AC3 (16,500 amps), 440 AC4 (33,000 amps) and 440 AC5 (46,000 amps).
- "Exel" switches comply with the relevant Temperature Rise, and Making and Breaking Capacity Tests of B.S.861: Part 1, 1955, and switchfuses with B.S.2510:1954.

. . . and so many other features, too

Write for M.E.M. List No. 450

MEM

MIDLAND ELECTRIC MANUFACTURING CO. LTD., REDDINGS LANE, TYSELEY, BIRMINGHAM 11.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

8 Dec.—Heston and Isleworth B.C. Supply and erection of 41 Group "A" steel columns with mercury colour-corrected lamps/lanterns/gear and removal of 28 existing columns along Vicarage Farm Rd, Hounslow.—Advertised 24 Nov. issue.

8 Dec.—Irish Lighthouse Service. Supply of lamps for year.—See 1 Dec. issue.

8 Dec.—Smethwick B.C. Supply and installation of nine passenger/perambulator lifts at three housing sites. Borough Surveyor, Council Hse. Deposit £2 2s.

8 Dec.—Swansea B.C. Supply of one 3 kW d.c. generator.—See 17 Nov. issue.

10 Dec.—Bootle B.C. Supply of (Item 13) cables and electrical goods and (Item 14) lamps for year.—See 1 Dec. issue.

10 Dec.—Cornwall C.C. Applications invited for inclusion in approved list for (Item 17) electrical installations.—See 1 Dec. issue.

10 Dec.—Edinburgh C.C. Supply and erection of five electrically operated overhead doors at Craigmillar Refuse Disposal Wks. —See 1 Dec. issue.

10 Dec.—Northwich U.D.C. Installation of power points in 50 pre-war houses.—See 1 Dec. issue.

12 Dec.—Berkhamsted R.D.C. Rewiring of 19 houses Oliver's Close and Water End Rd. Surveyor, C. Laidman, 275 High St.

12 Dec.—Downpatrick R.D.C. Electrical work in two blocks of four-storey maisonnettes and one block of three-storey single-person flats in Windmill St, Ballynahinch.—See 24 Nov. issue.

12 Dec.—Grimsby B.C. (c) Electrical installation, on fixed-price basis, in remodelling South Parade Primary Junior School.—See 24 Nov. issue.

12 Dec. Manchester C.C. Supply and erection of passenger lift in City Courts and Juvenile Court.—See 24 Nov. issue.

12 Dec.—Roscommon C.C. Supply and installation of 3-ph. motors, horizontal centrifugal pumps and water level indicator at Monksland, Athlone.—See 1 Dec. issue.

12 Dec.—Ryton U.D.C. (5) Electric lighting and heating work in proposed eight single-person dwelling and three aged persons' bungalows.—See 1 Dec. issue.

12 Dec.—Stockport B.C. 2. Electrical installation in proposed Welfare Clinic, Longford Rd West, Reddish.—See 3 Nov. issue.

12 Dec.—West Hartlepool B.C. Electrical installation in 16 old people's flatlets, Owton Manor estate.—See 24 Nov. issue.

13 Dec.—Kirkcaldy T.C. (b) Electrical work in erection of new hall at Links St.—See 3 Nov. issue.

13 Dec.—Swindon B.C. Supply of (Item 12) lamps, cables, etc. for year from 1 Jan., 1961. Borough Engineer, Civic Offices.

14 Dec.—Kingston upon Hull C.C. Light and power installations in Adelaide County Primary School.—See 1 Dec. issue.

14 Dec. Larne B.C. Rewiring of 24 Arcon prefabricated bungalows, Edward Ave.—See 1 Dec. issue.

14 Dec.—Leeds Hospital Board. (b) Electrical work in reorganisation of main block (Stage III) at Stanley Royd Hospital, Wakefield. Applications to Board Architect, Park Parade, Harrogate, by above date. Deposit £2 2s.

14 Dec. Matlock U.D.C. Supply and installation complete of nine sewage pumps at four pumping station in Darley Vale.—See 6 Oct. issue.

14 Dec.—Waterford C.C. Supply and erection of two 20 g.p.m. pumps and 380 V 3-ph. motors for Kill and Bonmahon water supply scheme.—See 17 Nov. issue.

15 Dec.—Stockport T.C. Electrical installation in new dormitory wing and extension at "Reinbek," Aged Person's Home, Bramhall La.—See 1 Dec. issue.

16 Dec.—Dunbarton C.C. Erection and wiring only of fluorescent street and footpath lighting comprising: 35 points Seafar—5 area and 88 points Maurhead 4 area at Cumbernauld. Applications to County Lighting Superintendent, W. Arthur, 24 George Sq, Glasgow C.2, by above date.

16 Dec.—Maidstone B.C. Electrical installation in conversion of 13 London Rd into an old people's hostel.—See 1 Dec issue.

16 Dec.—Rochester C.C. Electrical installations on fixed-price basis in 36 houses Cliffe Rd estate Section II. Housing Manager, Guildhall. Deposit £2 2s.

16 Dec.—Sunderland B.C. Electrical installation in Maternity and Child Welfare Clinic, Hylton Castle estate.—Advertised 24 Nov. issue.

16 Dec.—Wandsworth B.C. (h) Supply of lamps; and (i) electrical works for year from 1 April, 1961.—See 24 Nov. issue.

17 Dec.—Birkenhead B.C. Supply of lamps for year.—See 1 Dec. issue.

19 Dec.—Nottingham T.C. Supply of (Item 1) lamps and accessories for schools, etc., for year.—See 1 Dec. issue.

19 Dec.—West Lothian C.C. Supply and erection of 31 200 W sodium lanterns on 35 ft steel columns with 10 ft 6in. outreach for A8/A89 Starlaw and A8/A899 Broxburn junctions lighting.—See 24 Nov. issue.

20 Dec.—Southampton B.C. (a) Electrical installation renewal at Millbrook Secondary Boys' School and (b) electrical installation in new Glen Eyre Secondary Boys' School. —See 1 Dec. issue.

21 Dec.—Fareham U.D.C. Supply and installation of sewage pump, complete with motor and control gear for Peel Common.—See 24 Nov. issue.

22 Dec.—Ealing B.C. Electrical installation renewal at St. Ann's Secondary Girls' School, Springfield Rd.—Advertised 1 Dec. issue.

23 Dec.—Eastleigh B.C. Supply of (Item 10) street lighting lamps for year from 1 April, 1961. Borough Engineer and Surveyor, Town Hall.

30 Dec.—Denby Dale U.D.C. Supply, erection and wiring of 225 25 ft Stanton concrete columns together with 140 W sodium lamps/lanterns/gear along A636 Wakefield Rd and A635 Barnsley Rd. Engineer and Surveyor, Council Offices, Denby Dale, near Huddersfield. Deposit £2.

30 Dec.—Monaghan C.C. (b) Erection and installation of two pumping sets to deliver 28 g.p.m. at a 106 ft head for Rockcarry scheme. Supply and/or erection of two 42 g.p.m. pumps at a 128 ft head for Newbliss. —See 1 Dec. issue.

31 Dec.—Llanfyllin R.D.C. Electrical installation in new offices. Council Clerk, G. Jones, Council Offices, Llanfyllin, Montgomery.

3 Jan.—Radcliffe B.C. Supply and installation of 43 140 W sodium lamps on 25 ft columns and brackets, plus removal of 28 existing units along A667, Ringley Rd.—See 1 Dec. issue.

5 Jan.—Belfast C.C. (a) Electrical installation in Fane St Secondary School. City Architect's Dept., 40 Academy St, Belfast 1.

6 Jan.—Belfast C.C. (a) Supply of condenser tubes and (b) supply and erection of 25 germanium diode rectifier sets (Specifications W184 and 5, respectively). Electricity Dept., East Bridge St, Belfast 1.

6 Jan.—Wanstead and Woodford B.C. Supply of (Item 13) for year. Details from Borough Engineer and Surveyor, Municipal Offices, E.8, on receipt of large 6d s.a.e.

7 Jan.—Bath C.C. Supply of (Item 40) l.v. cables; (41) discharge lamps; (42) tungsten lamps and fittings; (43) steel and concrete columns; (44) street lighting lanterns; (45) control gear and capacitors; (46) time switches, for year from 1 April, 1961. City and Waterworks Engineer, Guildhall.

10 Jan.—Dunblane B.C. Supply and erection of seven Group "A" concrete columns/lanterns/auxiliary equipment, plus the resiting of six columns along A9.—See 10 Nov. issue.

16 Jan.—Bermondsey B.C. Supply of lamps for year from 1 April, 1961. Town Clerk, Municipal Offices, Spa Rd, S.E.16.

17 Jan.—Newcastle upon Tyne C.C. Supply and installation of two automatic passenger lifts in each of two 15-storey blocks of flats at Longbenton estate (Unit 4). City Architect, 18 Cloth Market, Newcastle upon Tyne 1.

28 Jan.—Camborne-Redruth U.D.C. Supply of (Item 24) electrical equipment and fittings for year ending 31 March, 1962. Council Clerk: S. C. Wilson.

1 Feb.—Oxford T.C. Supply and erection of two high-lift 3,500 g.p.m. and two low-lift 3,850 g.p.m. pumps complete with motors, switchgear and cabling.—See 10 Nov. issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 109 queries answered this week

"Colne" limit switches—makers of? T.E.—Asquith Electrics (Colne) Ltd., Walton St, Colne, Lancs.

"Duro" vacuum cleaners—suppliers of? P.P.—Brown Bros. Ltd., Gt. Eastern St, E.C.2.

"Lucia" sewing machines—agents for? Y.E.B.—Mitchell and Korsin Ltd., 1-2 Alfred Pl, W.C.1.

"Mysto" bowl fires—makers of? E.E.R. —Bescol (Electric) Ltd., 118 Parkfield Rd, Saltley, Birmingham 8.

McGraw Electric Co., Illinois, U.S.A. agents for? C.E.—Frank V. Magrini Ltd., 24 Royal College St, N.W.1.

"Paladin" food mixers—address for? L.E.B.—P.L.N. Ltd., 9 Devonshire Rd, Chiswick, W.4.

"Moulinex" coffee mill—agents for? E.E.B.—Brattel Electric Co. Ltd., 27 Old Bond St, W.1.

"Fri-Fri" fryers—agents for? G.H.—Aga Heat Ltd., 30 Orchard St, W.1.

"Burgess" paint sprayers—makers of? W.K.—Burgess Products Co. Ltd., Brookfield Rd, Hinckley, Leics.

ANSWER WANTED

"Vistosi" lighting fittings—agents for? R.D.—

No date stated—Limerick T.C. Supply of electrical laboratory equipment.—See 1 Dec. issue.

No date stated—N.I. Hospitals Authority. Electrical engineering services installation in new home for nurses at Ards Hospital.—See 1 Dec. issue.

No date stated—North of Scotland H.E.B. Supply and erection of 132 kV steel tower double circuit spur line to Burghmuir. Chief Electrical and Mechanical Engineer, 16 Rothesay Terr, Edinburgh 3. Deposit £2 2s. —Advertised in this issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

20 Dec.—America. One 230 kV, and four 161 kV, 1,200 A circuit-breakers and one 110 kV 600 A oil or air blast circuit-breaker. Dept. of Interior, Bureau of Reclamation, Denver Federal Center, Colorado. B.o.T. (ESB/30810/60).*

20 Dec.—India. Electronic equipment, 25 items. Director, Central Stores Purchase Dept., Government of Andhra Pradesh, Hyderabad, Dn. B.o.T. (ESB/31434/60).*

20-21 Dec.—Pakistan. Hoists, four groups, of 1,000, 2,000 and 4,000 lb capacity. Chief Controller of Stores, Eastern Bengal Railway, Pahartali, Chittagong. B.o.T. (ESB/31382/5/7 and 8/60).*

21 Dec.—Pakistan. One 64 V, 200 A motor-generator. Chief Controller of Stores, Eastern Bengal Railway, Pahartali, Chittagong. B.o.T. (ESB/31381/60).*

21 Dec.—S. Africa. Two 750 kVA diesel generating sets. Secretary, Union Tender Board, 291 Bosman St, Pretoria. B.o.T. (ESB/30792/60).*

22 Dec.—America. Supervisory control and telemetering control boards for Upper and Lower Molina power plants. Dept. of the Interior, Bureau of Reclamation, Bldg 53, Denver Federal Center. B.o.T. (ESB/31335/60).*

29 Dec.—America. Four 51,800 h.p. Kaplan turbines for Dardanelle Lock and Dam Power Plant, Arkansas River, Little Rock District U.S. Corps of Engineers. B.o.T. (ESB/31418/60).*

29 Dec.—Australia. Instrument cords and cordage, 15 items. Controller, Stores and Contracts, Postmaster-General's Dept., 114 Russell St, Melbourne C.1. B.o.T. (ESB/314553/60).*

31 Dec.—Yugoslavia. Dynamometers, mechanics stethoscopes, coil and condenser testers, tachometers, rev counter, penetrometers, moisture meters, heating cables, thermostats, steriliser, tensiometers, thermometers and micro switches. Laboratorija Export-Import, Zagreb, Ilica 48. B.o.T. (ESB/31358/ICA).*

4 Jan.—India. Thirty 1·5 MVA 33/11 kV transformers and nine 3 MVA 33/11 kV transformers. Superintending Engineer, Technical (Electrical), 10/13 A. C. Guards, Khairatabad Post, Hyderabad 4, Andhra Pradesh. B.o.T. (ESB/30879/60).*

9 Jan.—Pakistan. Cable terminal boxes, etc. Mr F. Rizwi, Purchase Co-ordinating Officer, Block No. 32, Post and Telegraph Directorate General, Karachi. B.o.T. (ESB/31450/60).*

11 Jan.—Sudan. Workshop distribution switch and fuse board. Sudan Government Purchasing Agent, 3/5 Cleveland Row, St. James's, S.W.1. B.o.T. (ESB/30848/60).*

12 Jan.—Pakistan. 4,800 public lighting fittings comprising 12 in. c.i. cones, reflectors, etc. Directorate General of Supply and Development, Frere Rd, Karachi. B.o.T. (ESB/31352/60/ICA).*

18 Jan.—Australia. 11 kV, 250 MVA switchgear: three circuit-breakers, 21 switch units, switch-fuse units. Chief Engineer, Southern Electric Authority of Queensland, 156 Boundary St, Brisbane. B.o.T. (ESB/30781/60).*

19 Jan.—India. Two 7·5 MVA 66/33 kV and two 5 MVA 33/11 kV transformers. Specification APT 28/60 from Superintending Engineer (Technical Electrical), 10-2-3 Intekhab Manzil, A. C. Guards, Hyderabad, on production of a challan for Rs 25.5 nP.

2 Feb.—India. 66, 110 and 230 kV insulators and accessories. Superintending Engineer, Technical (Electrical), 157 Mount Rd, Madras 2. B.o.T. (ESB/30880/60).*

15 Feb.—Australia. 12-channel carrier telephone system. Secretary, Victorian Railways, Melbourne C.1. B.o.T. (ESB/31454/60).*

CONTRACTS PLACED

Barton-on-Humber U.D.C. Supply and erection of 36 fluorescent street lighting units and removal of 26 existing tungsten units, Brigg Electrical Co. Ltd., £927.

Bradford C.C. Rewiring of Cartwright Hall, H. Smith (Bradford) Ltd., £937.

Enfield B.C. Supply of (1) lanterns and gear; (2) columns and brackets; (3) erection: (1) Atlas Lighting Ltd., £5,127; (2) Midland Lighting and Bldg Ltd., £8,393; and (3) H. Smyth, £3,208. Recommended.

London C.C. Supply and installation of water heaters—dwellings on Becontree estate, Essex; Downham estate, Lewisham; and Hanwell estate, Ealing, F. J. Baynes and Co. Ltd., £19,904 16s, £8,428 4s 9d and £9,295 2s 9d respectively. Supply and installation of three passenger lifts in new buildings for London School of Printing and Graphic Arts. Express Lift Co. Ltd., £52,000.

Newton Abbot R.D.C. Supply and erection of 61 Group "A" columns and lanterns at Kingskerswell, A.E.I. Lamp and Lighting Co. Ltd., £4,739.

Staines U.D.C. Provision, erection and resiting of street lighting, Midland Lighting and Bldg Ltd., £12,028.

Willesden B.C. Electrical installations in South Kilburn redevelopment area and Mortimer Rd Old People's Club, C.J.L. (Electrical) Ltd., £1,377 and £964 respectively. Recommended.

TRADE NOTES

Agents. Two new agents appointed by Elkay Electrical Manufacturing Co. Ltd. are Mr A. R. Duff, 73 Robertson St, Glasgow C.2, for Scotland, and Mr L. W. York, 179 Wood La, Earlswood, Solihull, Warwick.

Change of Name. As from 2 Jan., 1961, Wakefield-Dick Industrial Oils Ltd. will be renamed Castrol Industrial Ltd.

Change of Address. The London area order office of Atlas Lighting Ltd. is now: Angel Wks, Angel Rd, Edmonton, N.18. Telephone: Edmonton 3050.

Expansion. British Geon Ltd. are planning yet another expansion of their p.v.c. plant at Barry, South Wales. A £2 million extension is due for completion next year.

New Shop. Vallance and Davidson have opened a new electrical, radio and TV retail outlet at New Market St, Leeds.

Service Stopped. Telephone Mnfg. Co. Ltd. have now ceased to provide service facilities for "Temco" clocks.

New Factory. A new factory for Sifam Electrical Instruments Ltd., in Woodland Rd, Torquay, is to be officially opened on 9 Dec. by Mr F. M. Bennett, M.P. for Torquay.

S.A. Import Tariff. Under amendments to the South African customs tariff, an intermediate duty of 15% (payable by U.K. firms) is now levied on all household refrigerators or cabinets up to 12 cu ft capacity. Previously the tariff applied to those of 5 to 12 cu ft.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Certor. 808,262. Class 10. Blankets. Macdonald and Son Ltd., Portland Mill, Ashton-under-Lyne.

Discus. 789,533. Class 7. Blowing machines, machine couplings, motors, generators, etc. Watkins and Watson Ltd., 17 White Lion St, N.1.

Dreamline. B806,549. Class 7. Mixing, washing and drying machines. Domestic Electric Rentals Ltd., 3 The Green, Twickenham, Middx.

Dualux. 805,898. Class 7. Steam Electric Co. Ltd., 31 Vauxhall Bridge Rd, S.W.1.

Monomatic. 764,644. Class 7. Machines and apparatus for laundering, airing, drying, washing, etc. Ada (Halifax) Ltd., West Mount Wks, Johnson St, Halifax.

Tasc. 797,178. Class 7. Variable speed transmission devices, speed governors, magnetic and induction couplings, etc. Pye Electric Ltd., 9 Upper Berkeley St, W.1.

NEW COMPANIES

Extracted from the Register Issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Atkins Electrical Co. Ltd., 6 Russell Gdns, W.14. Nom. cap.: £100. Dirs.: Ralph F. Atkins and Mrs Margaret S. Atkins.

Baxter and Wood Ltd. Manufacturers of and dealers in light metal and plastics fancy goods, electric light fittings, etc. Nom. cap.: £1,000. Dirs.: Samuel Baxter, 157 Finchley Rd, Kingstanding, Birmingham 22a: and Jeffrey H. Wood, 128 Elmbridge Rd, Birmingham 22b.

C. and A. Electrics Ltd., 352 Normanton Rd, Derby. Nom. cap.: £1,000. Dirs.: Albert F. Cholerton and Inez M. Cholerton.

Chestercol Ltd., Midland Bank Chmbrs, High St, Colchester. Electricians, etc. Nom. cap.: £1,000. Dirs.: to be appointed by subs. Subs.: Shirley Hart and Averill Hart.

Consortium Contractors and Engineers Ltd., 40 Chancery La, W.C.2. Nom. cap.: £12,000. Dirs.: not named. Subs.: Valerie A. Creasey and Sylvia M. Davies.

Kenneth Dolby Ltd., 45 Horsley Fields, Wolverhampton. Manufacturers of and dealers in vacuum cleaners, etc. Nom. cap.: £2,000. Dirs.: Kenneth Dolby and Bernard Grady.

Engelhard Development Co. of Canada Ltd. British address: Bath Rd, Cippenham, Slough. Registered in Ontario, Canada, in April, 1951, as Precious Metals Development (Canada) Ltd., and renamed as Engelhard Industries Development Company of Canada Ltd. on Sept. 2, 1953, and as above on Dec. 18, 1957. Capital: $500,000. Names of persons authorised to accept service: Sir Eric Speed and Gilbert L. Tugwell.

Impalco Foils Ltd., Invicta Wks, Alfred's Way, Barking By-pass, Barking To acquire such part of the assets and undertaking of Imperial Aluminium Co. Ltd., in the United Kingdom and elsewhere, as comprises the manufacture, production, sale and distribution of foils and foil products and containers, etc. Nom. cap.: £100. Dirs.: not named. Subs.: David C. F. Pearson and M. J. Wordley.

Linyonne Ltd., 12-13 Main Parade, Whitelands Ave, Chorleywood, Herts. Manufacturers of and dealers in electrical goods, etc. Nom. cap.: £100. Dirs.: Kenneth Watson and Mrs N. H. Watson.

Lyon-Sanders (Electrical) Ltd. Nom. cap.: £100. Dirs.: not named. Subs.: Ronald H. Lyon, 21 Nelson Ave, St. Albans: and Mrs Olive M. Sanders, The Croft, Delmar End La, Flamstead, St. Albans.

E. J. Roe and Co. Ltd., 3 South Ave, Stoke Park, Coventry. Engineers, automation, electronic and general manufacturers and designers, etc. Nom. cap.: £500. Dirs.: Edwd. J. Roe and Mavis L. Roe.

BUSINESS PROSPECTS

Aberdeenshire. £254,320 extensions proposed at Inverurie Academy.

Aldershot B.C. Tender: Public library extensions including second storey. Engineer.

Banstead U.D.C. Tender: 243 dwellings on Chapel Way area sites. Clerk.

Barrow-in-Furness. John Laing and Son, Carlisle, are contractors for Vickers-Armstrong (Engineers) Ltd. new health and physics laboratory.

Birkenhead. Reynolds and Scott, 9 Albert Sq, Manchester, architects for boys' R.C. secondary school at Park Rd West for Bishop of Shrewsbury.—Weightman and Bullen, 76 Rodney St, Liverpool, architects for assembly hall, kitchen and dining quarters at Rock Ferry Convent Grammar School.—A. Stanley Barnes and Dallow, 7 Hamilton Sq, Birkenhead, architects for hotel on site of Argyle Theatre, Argyle St, for T. Clarke.

Bishop Auckland. Newcastle Hospital Board, Benfield Rd, Newcastle, plan preliminary training school at General Hospital. Architects: Fennell and Baddiley, Bridge End Chmbrs, Chester-le-Street.

Blackpool. J. W. Anderson, 35 Clifton St, Blackpool, architect for £52,000 alterations at Chiswick Grove, Marton, factory premises for Empire Pools.—Premier Footwear (Fleetwood), Dock St, Fleetwood, plan Mowbray Drive industrial development.—H. O. Luder, 79 Regency St, S.W.1, architect for 166 flats and garages, Huntingdon Rd, planned by Alder Investments.

Bradford. City Architect to prepare plan for development of Richmond Rd site of Bradford Institute of Technology to provide departments of chemical technology and engineering, etc.

Burnley. B.T. Commission plans new club building off Rosegrove La.—Mecca Ltd., 76 Southward St, S.E.1, plan Inner Ring Rd site dance hall.

Buxton. Brake Linings Ltd. plan Bridge St factory extensions.

Castleford B.C. Tender: 72 dwellings in nine three-storey blocks, Whitwood Mere housing estate. Engineer and Surveyor.—B.C. Tender: Branch library, Queens Park Drive. Engineer.

Clitheroe B.C. £5,001 improved street lighting scheme planned.

Corby U.D.C. Tender: 18 old people's bungalows, etc., Rockingham Rd. Clerk.

Crosby B.C. Multi-storey flats and other forms of development planned. Engineer.

Croston. C. of E. authorities plan new Bishop Rawstorne secondary school.

Croydon. Sir Robert Tasker and Ptnrs, 3 Field Court, Gray's Inn, W.C.1, architects for block of showrooms and offices at Brighton Rd for Commercial and Industrial Structures.—Candycraft, Carmichael Rd, S. Norwood, S.E.25, plan additions and alterations to factory.—E. R. Scratchley, 30 High St, Thornton Heath, architects for Frank Watson (Croydon), Canterbury Rd, factory.

Darlington. Dorman Long (Steel), Zetland Rd, Middlesbrough, plan factory at Cumbie Way, Aycliffe industrial estate.—George Denham and Co., Lowmill Foundry, reported to be planning removal of premises to Longfield Rd.

Dartford. Albert E. Reed Paper Group, 105 Piccadilly, W.1, architects for extensions to Dartford Paper Mills.

Derby. Derby Diocesan Council of Education plan enlargement of diocesan training college by blocks of lecture rooms, hall, gymnasia, offices, hostel. Cost: £392,000.

Dorset. £280,000 Poole Grammar School for Boys planned at Cranford Heath.

Durham. Sir Basil Spence, 1 Canonbury Pl, W.1, architect for new women's college, Elver Hill.

Eastbourne. Gee, Walker and Slater, 100 Park La, W.1, plan shops, etc., at Chatsfield, Hampden Park and Winchester Hse site flats.

East Barnet U.D.C. Tender: 24 flats, Margaret Rd, New Barnet. Engineer and Surveyor.

Edmonton. H. Bernard, Eley's estate, Angel Rd, plan factory and offices.

Enfield B.C. Tender: 40 dwellings, Southbury Ave. Engineer.

Glasgow. John Watson and Co., 54 Black St, Glasgow C.4, plan factory at Kyle St.—R. F. Bluck and Associates, 147 Bath St, C.2, architects for Sauchiehall St restaurant for L. McLaughlin.

Grimsby T.C. £2,789 street lighting scheme for private housing estate planned.

Hampshire. The Plessey Co., Vicarage La, Ilford, Essex, plan industrial development on 66-acre Titchfield site. C.C. Education Committee, Winchester, plan £30,172 women's hostel for 20 students at County Farm Institute. Trust Houses, Shorts Gdns, Drury La, W.C.2, plan three-storey hotel adjoining Winchester Cathedral.

Hastings. B.B.C., Portland Pl, W.1, plan satellite TV station, Biscoe's Walk.

Hayes and Harlington U.D.C. Tender: 22 bungalows, 74 two-storey houses, 95 three-storey flats, 36 four-storey maisonnettes and garages, Frogmore Farm estate, Hayes, Middx. Engineer.

Ilford B.C. Electrical installations in 33 dwellings at Mayes Brood Meadows planned. Inclusion of seven more streets in street lighting improvement scheme. Cost: £4,300.

Ilkeston. Winster Products plan industrial development on land fronting Corporation Rd.

Kingston. Ides Ltd., Clarence St, Kingston, contractors for Jennings and Meacock's factory premises.

Leics C.C. Stage 2. Hinckley College Further Education planned. Architect.

Letchworth. Shelvoke and Drury Ltd. plan factory building; plans by Architects' Dept. of First Garden City, Letchworth, Herts.

Liverpool. Sir Alexander Gibb and Ptnrs, Queen Anne's Lodge, S.W.1, consulting engineers for new mill for R. Silcock and Sons.

London. Trehearne and Norman, Preston and Ptnrs, 83 Kingsway, W.C.2, architects for Sloane Ave and Draycott Ave, S.W.1, shops and flats.—R. Wood and Ptnrs, 29 Widmore Rd, Bromley, Kent, architects for hotel and showrooms at Kensington High St, W.14, for Gula Investments.—Sir Herbert Baker and Scott, Church Hse, Gt. Smith St, S.W.1, architects for £50,000 Mecklenburgh St, W.C.1, students' hostel for London University.—Stanley Peach and Ptnrs, 28 Eccleston Sq, S.W.1, architects for Sun Engraving Co.'s new industrial building at Kirby St and Saffron Hill, E.C.1.—Newman, Levinson and Ptnrs, 9 Mansfield St, W.1, architects for £150,000 administrative block, Holloway Rd, N.19.—Land Securities Investment Trust, Devonshire Hse, Piccadilly, W.1, plan 320 ft high office building, Victoria St.—H. Fitzroy Robinson and Ptnrs, 3 Gray's Inn Sq, W.C.1, architects for rebuilding of offices, flats, consulting rooms, etc., at 26-29 Park Cres, W.1.—Newman, Levinson and Ptnrs, 9 Mansfield St, W.1, architects for 258 ft high hotel with cinema and basement car park at junction Edgware Rd, George St and Nutford Pl.—Guy Morgan and Ptnrs, 12a Eaton Sq, S.W.1, architects for 30-storey block at junction of Sloane St and Brompton Rd, S.W.1.—Campbell-Jones and Sons, 9 Dowgate Hill, E.C.4, architects for large block of offices at site of 117-122 Cheapside, E.C.2.

Loughborough T.C. £2,350 improved lighting scheme planned for Derby Rd and Bishop Rd areas. Engineer.

Maidenhead. £275,000 extensions to Courtaulds Ltd. Staff architect: S. A. Hawkes, 16 St. Martins-le-Grand, E.C.1.

Margate. The Thanet Press plan rebuilding and extensions to Prices St printing works.

Middlesbrough B.C. £29,500 scheme for installing traffic signals at Marton Rd/Ladgate La junction.

Newburn. J. M. Angus, 3 Gallowgate, Newcastle, architect for club in Union Rd, Lemington, for Labour Club and Institute.

Northern Ireland. I.C.I., Millbank, S.W.1, plan factory on 200-acre Kilroot, Co. Antrim, site.—B.P., Britannic Hse, Finsbury Circus, E.C.2, plan £8 million refinery on 100-acre Sydenham site.—McCutcheon and Wilkinson, 34 High St, Ballymena, Co. Antrim, architects for Ministry of Commerce's £40,000 extensions to Ulster Chipboard Ltd.

Nottingham. Boots Cash Chemists, Nottingham, plan Beeston factory.

Oxford. Mansfield College plans £80,000 three-storey block of residential accommodation for students and tutor staff.—Marks and Spencer, Michael Hse, Baker St, W.1, plan retail store in Cornmarket and Market St.

Penzance. S.W. Hospital Board, Bristol, plan conversion of Edward Bolitho Home into maternity hospital at £29,819.

Peterborough. C. W. Shelton, South St, Stanground, Peterborough, plan 2,000 houses at Gunthorpe.

Peterhead. Radiation Ltd., 255 North Circular Rd, N.W.10, plan new factory.

Rayleigh U.D.C. Tender: 20 semi-detached three-bedroom houses, Cheapside. Engineer.

Scunthorpe. Metal Box Co. plan £1 million Scotter Rd factory.

Sheffield. The Alloy Steel and Iron Co., Carbrook St, Foundry, Sheffield 9, plan steel foundry and offices, Pottery La, Whittington Moor.—Hospital Board, Old Fulwood Rd, Sheffield, plan seven-storey radiotherapy building to £800,000 at Witham Rd, Broomhill. Architects: Adams, Holden and Pearson, 38 Gordon Sq, W.C.1.—E. G. Phillips, Son and Ptnrs, 26 Annesley Grove, Nottingham, consulting engineers for pathological laboratory at Mansfield and District General Hospital.—Oxley and Bussey, 97 Pinstone St, Sheffield, architects for developments at Grenoside Hospital.—F. M. Ownsnett, Lloyds Bank Chmbrs, Fawcett St, Sunderland, consulting engineer for development of Nether Edge Hospital.—Gleeds, 7 Clinton Terr, Derby Rd, Nottingham, quantity surveyors for improvements to wards at Grantham and Kesteven Hospital.—Mackenzie, Jarvis and Ptnrs, 34 Victory St, S.W.1, consulting engineers for admission block, entertainments hall and improvements to engineering services at Middlewood Hospital.—Dick, Everard, Keay and Gimson, 6 Millstone La, Leicester, consulting engineers for accommodation for chronic sick at Sunnyside Hospital, Hinckley.

Somerset C.C. Tender: Extensions to King Alfred Secondary School, Burnham-on-Sea, to provide 180 additional places. Plans under supervision of R. H. Gallannaugh and Ptnrs, Richmond St, Weston-super-Mare. Huish Grammar School planned at South Rd, to cost £200,000.

Stockton-on-Tees. W. Finlayson, Stockton, plan factory.—J. W. Towers and Co., 28 Bridge Rd, Stockton, plan warehouse and office block.—B.C. £1,083 better lighting scheme planned for A1 trunk road between Stockton and Eaglescliffe.

Sutton and Cheam B.C. Provision of sodium lamps for all side roads planned.

Walsall. Pleck Coachbuilding Industries, Wisemore, plan new premises at Garden St.—S. Tomkins and Sons, 12 Dudley St, plan Portland St factory premises.—£21,870 electric lamp scheme for residential roads planned.

Warrington. Liverpool Hospital Board plans £52,600 adaptation of smallpox hospital at Sankey.

Watford. Cayson Electrics, 139 Queens Rd, plan factory and offices, plot 14, Greenhill Cres, Holywell estate.—Dawe, Carter and Ptnrs, 32 Clarendon Rd, Watford, architects for warehouse and offices for Hertford Handbag Co.

Wellingborough. Jaques, Purkis and Coleman, 14 Spinney Rd, Irlingborough, Northants, plan Orchard Rd, Finedon, factory.

Welwyn Garden City. E. D. J. Mathews and Ptnrs, 3 Edbury St, S.W.1., architects for Digswell Lodge extensions, for I.C.I.

Whitstable. The Riverside Press, 72a New Rd, Gravesend, plan factory at south side of Thanet Way.

Wigan. Street Lighting Committee plan £2,843 for lighting on new development.

MEETINGS TO NOTE

THURSDAY, 8 DEC.

I.E.E. (Utilisation Section). "The Determination of the Electrical Characteristics of an Arc Furnace," J. Ravenscroft. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (Cambridge Electronics and Measurement Group). "Recent Progress in Microwave Valves," A. H. W. Beck. Cavendish Laboratory. 8 p.m.

I.E.E. (N. Scotland). "Induction Generators for Electricity Supply," C. L. C. Allan. Electrical Engineering Dept., Queen's College, Dundee. 7 p.m.

FRIDAY, 9 DEC.

I.E.E. (N. Eastern). "The Shielding of Overhead Lines Against Lightning," J. H. Grindley. Carlisle Technical College. 7 p.m.

I.E.E. (N Scotland). "Induction Generators for Electricity Supply," C. L. C. Allan. Robert Gordon's Technical College, Aberdeen. 7.30 p.m.

E.P.E.A. (Meter Engineers' Technical Group). "Electronics and Metering," A. J. Baggott. Caxton Hall, Westminster, S.W.1. 6.30 p.m.

MONDAY, 12 DEC.

I.E.E. (Electronics and Communication Section). "Topology Concepts in Network Theory," P. R. Bryant. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (Western). "Engineering Education at the Technical Universities in Western Germany," D. B. Welbourn, Professor D. B. Spalding and G. L. Ashdown. Bristol University. 6 p.m.

I.E.E. (N. Staffs). "Recent Developments in Colour Television," I. J. P. James. Duncan Hall, Stone. 7 p.m.

I.E.E. (N. Ireland). "Pumped Storage," R. W. Mountain. Joint meeting with Northern Ireland Association of the Institution of Civil Engineers. Civil Eng. Dept., David Keir Bldg, Queen's University, Belfast. 6.30 p.m.

I.E.E. (N. Eastern). Lecture: "Street Lighting," W. R. Stevens and H. M. Ferguson. Neville Hall, Westgate Rd, Newcastle upon Tyne. 6.15 p.m.

I.E.E. (Mersey and N. Wales). "The Potentialities of Artificial Earth Satellites for Radiocommunication," W. J. Bray. Town Hall, Chester. 6.30 p.m.

Birmingham Electric Club. "Subscriber Trunk Dialling," H. E. Francis. Grand Hotel. 6.15 p.m.

I.E.S. (Leicester). "Stage Lighting," E. E. Faraday and W. J. Furse. Nottingham. 6.15 p.m.

A.S.E.E. (Bournemouth and District). "Electricity in Agriculture," C. W. Gould. Grand Hotel, Firvale Rd. 8 p.m.

A.S.E.E. (N.W. London). "Infra-red and its Applications," E. Gradwell. Century Hotel, Wembley. 8.15 p.m.

TUESDAY, 13 DEC.

I.E.E. (N. Eastern). Lecture: "The Transmission of News Film Over the Transatlantic Cable," C. B. B. Wood and I. J. Shelley. Workington College of Further Education. 7 p.m.

I.E.E. (N. Western). "Pharmacology of the Mind," Prof A. D. MacDonald. Annual Joint Lecture in co-operation with the Manchester University. Engineers' Club, Manchester. 7 p.m.

I.E.E. (S.E. Scotland). "Energy Resources of Scotland," C. L. C. Allan and J. Henderson. Carlton Hotel, North Bridge, Edinburgh. 7 p.m.

I.E.E. (London Graduates and Students). "Electrical Engineering in the Naval Service," D. MacLaren. Savoy Pl, W.C.2. 6.30 p.m.

I.E.E. (N. Midlands Graduates and Students). "Distribution Design in Urban Areas," W. K. Billington. Gt. Northern Hotel, Wellington St, Leeds 1. 7 p.m.

I.E.E. Faraday lecture: "Transistors and All That," L. J. Davies. Brangwyn Hall, Swansea. 6.30 p.m.

I.E.S. "Visual Problems on Motorways," J. M. Waldram. Federation of British Industries, Tothill St, S.W.1. 6 p.m.

British Institution of Radio Engineers (Electro-Acoustics Group). "A Pulse Multiplex Stereophonic Broadcasting System," G. D. Browne. London School of Hygiene and Tropical Medicine. Keppel St, W.C.1. 6.30 p.m.

A.S.E.E. (Aldershot and Districts). "Television," A. W. Binnie. Queen's Hotel, High St. 8 p.m.

A.S.E.E. (Chester and District). "Electrical Equipment in the Refrigeration Industry," A. Etherington. Westminster Hotel, City Rd. 7.45 p.m.

A.S.E.E. (Portsmouth and District). "Corrosion in Action." Committee Rooms, Ministry of Labour Offices, Lake Rd. 7.30 p.m.

A.S.E.E. (York). "The Protection of Electrical Installations," J. A. Robbins. Royal Station Hotel. 7.30 p.m.

A.S.E.E. (Oxford and Districts). "The Testing of an Electrical Installation," T. Howell. Employment Exchange. 8 p.m.

WEDNESDAY, 14 DEC.

I.E.E. (Supply Section). "A Basis for Short-Circuit Ratings for Paper-Insulated Cables up to 11 kV," L. Gosland and R. G. Parr, and "Short-Circuit Ratings for Mains Cables," G. S. Buckingham. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (S. Western). "The Application of Irradiation in Industry," M. C. Crowley-Milling. Exeter University, Exeter. 3 p.m.

I.E.E. (N Lancs). "Discrimination Between H.R.C. Fuses," E. Jacks. N.W.E.B. Lecture Theatre, Jubilee St, Blackburn. 7.15 p.m.

I.E.E. (Rugby). "Some Considerations in the Application of Power Rectifiers and Converters," J. P. McBreen. Rugby College of Technology and Arts, Rugby. 6.30 p.m.

I.E.E. (Sheffield). "The Determination of the Electrical Characteristics of an Arc Furnace," J. Ravenscroft. University, Mappin St, Sheffield. 6.30 p.m.

I.E.E. (S.W. Scotland). "The Protection of Electrical Systems," H. G. Bell. Institution of Engineers and Shipbuilders, 39 Elmbank Cres, Glasgow. 6 p.m.

Institution of Mechanical Engineers. "Machine Tool Research, Design and Utilisation." Dr D. F. Galloway. Birdcage Walk, S.W.1. 6 p.m.

Women's Engineering Society (London). "Power Transmission by Submarine Cable," Capt F. Potts. "Hope House," 45 Great Peter St, S.W.1. 7 p.m.

Royal Society of Arts. "The Functions of Trade Unions in Industry and Commerce," W. J. Carron. John Adam St, W.C.2. 6 p.m.

Society of Instrument Technology (Control Section). "Speed Control of Aircraft Gas Turbines for Jet Propulsion." R. J. Walsh and R. W. Haigh. 26 Gt. Portland St, W.1. 7 p.m.

Society of Instrument Technology (Bristol). Discussion: "Automation: Who Benefits?" Transport Hse, Victoria St, Bristol 1. 7.30 p.m.

Society of Instrument Technology (Cheltenham). "Automatic Transmission," E. Nichol. Belle Vue Hotel. 7.30 p.m.

I.E.S. (Sheffield). "Chance and Vision," D. L. Smare. Grand Hotel. 6.30 p.m.

British Institution of Radio Engineers (Merseyside). "V.H.F. Sound Broadcasting," L. G. Dive. The Adelphi Hotel, Liverpool. 7 p.m.

British Institution of Radio Engineers (Southern). "Some New Piezo-electric Devices," A. E. Crawford. Lanchester Bldg, University of Southampton. 7 p.m.

Plastics Institute (Yorks). "Dip Coating," D. Sharp. St. Mark's Hse, 186 Woodside La, Leeds. 7.15 p.m.

A.S.E.E. (Birmingham). "Plant Engineering in the Food Industry," L. A. Hand. Exchange and Engineering Centre, Stephenson Pl. 7.30 p.m.

A.S.E.E. (Luton). "The National Inspection Council," H. C. Breeze. Luton College of Technology, Park Sq. 8.15 p.m.

A.S.E.E. (Wolverhampton and District). "Modern Light Sources and their Application," W. A. R. Stoyle. Chamber of Commerce, District Bank Chmbrs, Lichfield St. 7.45 p.m.

THURSDAY, 15 DEC.

I.E.E. (Education Circle). Discussion: "How to Pass Examinations or the Psychology of Study." Savoy Pl, W.C.2. 6 p.m.

I.E.E. (Southern). Annual dinner and dance. The Polygon Hotel, Southampton.

I.E.E. (Irish). "Terminal Equipment for High Voltage D.C. Schemes," Professor C. T. G. Dillon. Physical Laboratory, Trinity College, Dublin. 6 p.m.

Institution of Mechanical Engineers (Nuclear Energy Group). Discussion: "The Impact of a Three-Fuel Economy." Birdcage Walk, S.W.1. 6 p.m.

Chelmsford Engineering Society. "The Genealogy of Remote Control," A. L. Hancock. Crompton's Social Hall. 7.30 p.m.

S. Wales Institute of Engineers. "Experiments in S. Wales with an Instrumented Coal Plough," L. Finkelstein, W. T. A. Morgans, C. D. Pomeroy and V. M. Thomas. Institute Bldgs, Park Pl, Cardiff. 6 p.m.

Diesel Engineers and Users' Association. "Report on Diesel Engine Working Costs and Performance 1959-60." Institute of Marine Engineers, 76 Mark La, E.C.3. 2.30 p.m.

Institution of Production Engineers (Southern). "Electronic Data Processing Allied to Production Engineering," F. W. Purchall. George Hotel, King St, Reading. 7.30 p.m.

Society of Instrument Technology (Chester). Joint meeting with North Wales Metallurgical Society. "Instrumentation in Steelmaking," N. P. Bacon. Blossoms Hotel. 7 p.m.

A.S.E.E. (S. London Branch). "Management and Utilisation." Greyhound Hotel, High St, Croydon. 8 p.m.

FRIDAY, 16 DEC.

I.E.E. (Mersey and N. Wales). "The Logmotor—A Cylindrical Brushless Variable-Speed Induction Motor," Prof F. C. Williams, F. R. Laithwaite, J. F. Eastham and L. S. Piggott. Town Hall, Chester. 6.30 p.m.

A.S.E.E. (Stoke and Crewe). "The Factories Act and the Electrical Engineer," G. L. Leighton. Grand Hotel, Hanley. 7.30 p.m.

SATURDAY, 17 DEC.

A.S.E.E. Gala Ladies' Night. Connaught Rooms, Gt. Queen St, W.C.2.

GAZETTE ANNOUNCEMENTS

BANKRUPTCY ACTS

Receiving Order

Bradford. H. Rose, electrical goods wholesaler, carrying on business at 5 Carlisle Terr, Bradford 8. Receiving order dated 22 Nov.

First Meeting and Public Examination

Norwich. B. G. Firman, electrician, formerly carrying on business as Extol Electrics, at 1 Hopewell Terr, Elvington. First meeting: 11 a.m., 8 Dec., at Norfolk Hse, Exchange St, Norwich; and public examination: 10 a.m., 24 Jan., at Shirehall, Norwich.

Intended Dividends

Luton. C. R. Clarke, electrical contractor, formerly carrying on business at Kingham Way. Last day for receiving proofs for intended dividend: 10 Dec., to trustee: C. A. Taylor, 15 Guildhall Rd, Northampton.

Macclesfield. C. Davies, electrical contractor, of 39 Moss Brow, West Bollington. Last day for receiving proofs for intended dividend: 12 Dec., to trustee: G. H. Eaves, 47 Mosley St, Manchester 2.

Plymouth. L. W. Brown, radio, television and electrical engineer and dealer, carrying on business at 18 Lower Lux St, Liskeard. Last day for receiving proofs for intended dividend: 13 Dec., to trustee: A. D. Gwyther, First Floor, Royal Bldg, St. Andrew's Cross, Plymouth.

Blackpool. G. Green, battery assembler, formerly carrying on business as Fylde Batteries at 79 Back High St. Last day for receiving proofs for intended dividend: 20 Dec., to trustee: J. A. Freeman, 8 Manchester Rd, Bury, Lancs.

COMPANIES ACTS

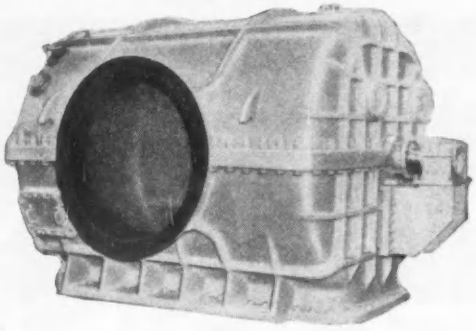
Trinity Electric Co. Ltd. Last day for receiving proofs for intended payment to preferential creditors: 10 Dec., to liquidator: F. M. Collins, Inveresk Hse, 346 Strand, W.C.2.

A.J.C. Electrics Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 12 Dec. Persons intending to appear to notify Cochrane and Cripwell, 119 Finsbury Pavement, E.C., by 1 p.m., 10 Dec.

S.A.L. Electrical Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 12 Dec. Persons intending to appear to notify Edwin Coe and Calder Woods, 7 New Court, Lincoln's Inn, W.C.2, by 1 p.m., 10 Dec.

Jacques (Electrical) Ltd. and Millmans of Putney Ltd. Petitions for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 12 Dec. Persons intending to appear to notify Cochrane and Cripwell, 119 Finsbury Pavement, E.C.2, by 1 p.m., 10 Dec.

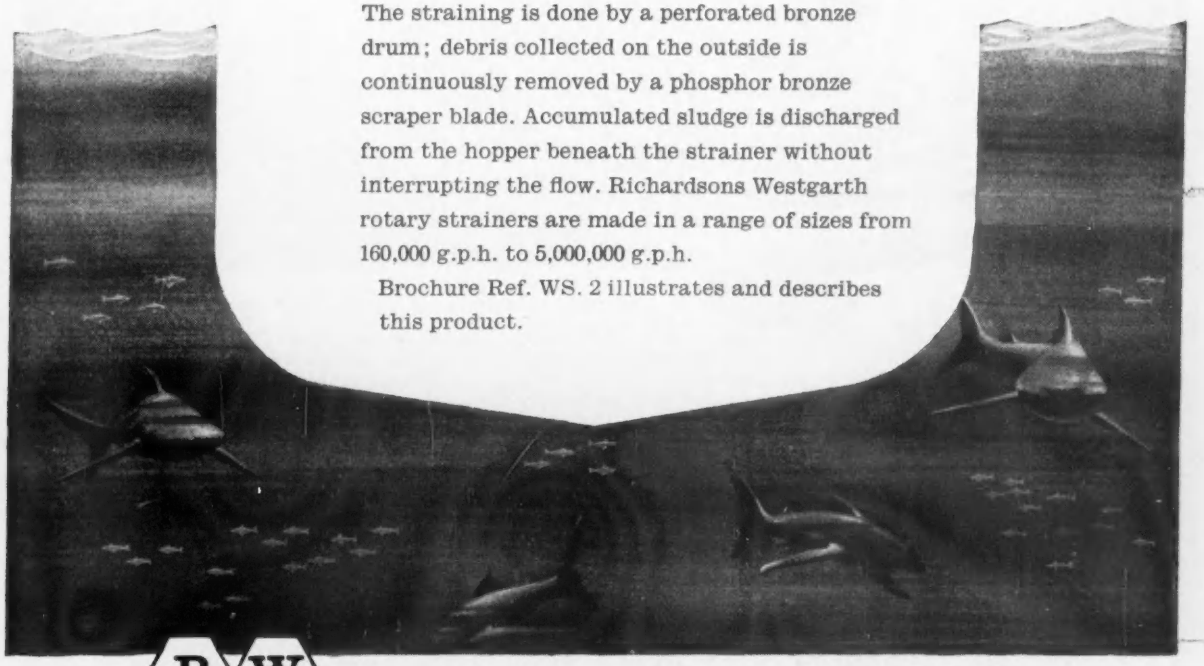
F. and S. Domestic Appliances (Dalston) Ltd. First meetings of creditors and contributories to be held at Room 401, Inveresk Hse, 346 Strand, W.C.2, on 13 Dec., at 10.15 and 10.45 a.m., respectively.



Enough water to float the 'Queen Mary'

Six Richardsons Westgarth 'Deptford' rotary water strainers strain the condenser cooling water at the Aberthaw Power Station, and are capable of handling 20,000,000 gallons in forty minutes—enough water to float the 'Queen Mary'. The straining is done by a perforated bronze drum; debris collected on the outside is continuously removed by a phosphor bronze scraper blade. Accumulated sludge is discharged from the hopper beneath the strainer without interrupting the flow. Richardsons Westgarth rotary strainers are made in a range of sizes from 160,000 g.p.h. to 5,000,000 g.p.h.

Brochure Ref. WS. 2 illustrates and describes this product.



RICHARDSONS WESTGARTH (HARTLEPOOL) LTD.

A member of the Richardsons Westgarth Group

Hartlepool, Co. Durham and at 58 Victoria Street, London, S.W.1.
59 Mosley Street, Manchester, 75 Buchanan Street, Glasgow.

RW 58

When your customers ask for radiant plates....

Remember THAT REDRING PLATES

GIVE FASTER COOKING, BETTER SIMMERING AND MORE ECONOMY

Better than ever advertising backing—with campaigns reaching over 30 million adult readers! *Better than ever* 'Slimline' design which clips seconds even off previous *Redring* times!

There's only one brand of REDRING radiant plate. There's only one kind of REDRING speed and efficiency. When your customers ask for 'REDRING'—it's only fair to see that they get just that. As soon as they cook with a genuine REDRING plate—they'll *see* you've given them the best!

Don't forget these **REDRING** advantages

- **Quick-off-the-mark-cooking**
- **Finest control of all**
- **Most economical to use**
- **Easy to fit without fuss**

STOCK UP NOW, AND WRITE FOR DISPLAY MATERIAL:

REDRING Slimline Radiant Plates

Made only by AEI and guaranteed for two years

HEATING AND WELDING DEPARTMENT
ASSOCIATED ELECTRICAL INDUSTRIES LIMITED, TRAFFORD PARK, MANCHESTER 17

CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

BOROUGH OF EALING

RENEWAL OF ELECTRICAL INSTALLATION AT ST. ANN'S SECONDARY GIRLS' SCHOOL SPRINGFIELD RD, W.7

TENDERS are invited for the above-mentioned work. Specification and Tender from the Borough Engineer, Town Hall, Ealing, W.5, on receipt of deposit of £1, returnable on receipt of bona fide Tender. Closing date: 22 Dec., 1960.

E. J. COPE-BROWN,
Town Clerk.
(T 41)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

132 kV TRANSMISSION LINE SPUR TO BURGHMUIR (PERTH)

TENDERS are invited for the supply, delivery and erection of the above double circuit steel tower line spur.

Copies of the Tender Document may be obtained on application to the Board's Chief Electrical and Mechanical Engineer, 16 Rothesay Terr, Edinburgh 3, on receipt of a deposit of £2 2s (returnable). The Board do not bind themselves to accept the lowest or any tender. (T 84)

APPOINTMENTS VACANT

LONDON ELECTRICITY BOARD

ASSISTANT DISTRIBUTION ENGINEER

APPLICATIONS are invited for the above position at Falcon Hse, Aldersgate St, E.C.1.

Applicants should have a sound technical education to the standard of the Higher National Certificate, and possess practical experience in all branches of Engineering work associated with the organisation of a District distribution department.

The post is graded under Schedule A of the National Joint Board Agreement as Class J, Grade 11, £1,015 per annum rising to £1,140 per annum, inclusive of London Allowance.

Applications stating age, qualifications and experience should be sent direct to the Manager, Central District, Falcon Hse, Aldersgate St, London E.C.1., to reach his office not later than ten days from the publication date of this notice, Please quote ref.: PER/V/3154/T. (T 102)

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

Vacancy No. E.T./AV/174/60.
SHIFT CONTROL ENGINEER

REQUIRED at Newton Abbot Power Station.

Superannuation Scheme. Salary: N.J.B. Class F, Grade 10, Scale 5, £825/£940 per annum, plus 10% Shift Allowance (minimum £90 p.a.),

Candidates should possess good qualifications and have had training and experience in the control and operation of steam generating plant and main switchgear.

Previous applicants need not re-apply.

Applications on Form AE6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 19 Dec., 1960. (T 99)

YORKSHIRE ELECTRICITY BOARD

No. 7 (Grimsby) Sub-Area

SECOND ASSISTANT ENGINEER
(INDUSTRIAL DEVELOPMENT)

CANDIDATES should hold at least the Higher National Certificate in Electrical Engineering and will be required to advise consumers on the utilisation of electricity in industry. They should also have experience in negotiations for supply to industrial consumers. Experience of street lighting, industrial space heating and a knowledge of general tariff structures will be an added advantage.

Salary: N.J.B. Class K, Grade 7 (Scale 12), £1,350/£1,500 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 7 (Grimsby) Sub-Area, Moss Rd, Grimsby, not later than 23 Dec., 1960.

No. 1 (Bradford) Sub-Area

BRADFORD DISTRICT
THIRD ASSISTANT DISTRICT ENGINEER
(TWO POSTS)

Applicants should have passed the Graduateship examination of the Institution of Electrical Engineers or hold recognised equivalent technical qualifications, have substantial experience in construction, operation and maintenance of high voltage systems, underground cables and overhead lines, substations and medium and low voltage networks, preferably including direct current systems.

Candidates must be prepared to reside within the District and undertake standby duties if required.

Salary: N.J.B. Class K, Grade 9 (Scale 10), £1,190/£1,325 per annum.

Sub-Area Headquarters

FOURTH ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)

Applicants should hold graduate membership of the Institution of Electrical Engineers or other acceptable technical qualifications. They should have had sound experience in the operation and maintenance of overhead and underground distribution networks, working at voltages, preferably up to 33 kV. This post will involve participation in standby duties.

Salary: N.J.B. Class L, Grade 13 (Scale 7), £965/£1,090 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 1 (Bradford) Sub-Area, 45-53 Sunbridge Rd, Bradford 1, not later than 23 Dec., 1960.

No. 4 (Leeds) Sub-Area

FOURTH ASSISTANT ENGINEER
(DRAUGHTSMAN [CIVIL])

Applicants should have had a recognised technical training and experience in the design and detailing of new buildings and in the conversion of existing buildings.

Experience in the preparation of Bills of Quantities and Estimates and the ability to design simple reinforced concrete and/or steel structures will be an advantage.

Salary: N.J.B. Class L, Grade 12 (Scale 8), £1,040/£1,165 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 4 (Leeds) Sub-Area, Bramhope, nr. Leeds, not later than 23 Dec., 1960. (T 105)

THE NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments which are subject to the conditions of the National Joint Board.

Area Board Headquarters

SENIOR ASSISTANT ENGINEER
INDUSTRIAL SECTION
CHIEF COMMERCIAL OFFICER'S DEPARTMENT

Applicants should be suitably qualified engineers and must have a wide experience of the industrial application of electricity, be capable of conducting and advising on negotiations for industrial supplies including preparation of special agreements, and have a sound knowledge of the economics of electricity supply, tariff structure and distribution engineering. Previous experience in the Electricity Supply Industry and a knowledge of the economics of works generation in the steel and chemical industries are desirable.

Salary: Schedule B, Class AX, Grade 1, £1,825/£2,085.

York Sub-Area

THIRD ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)
SUB-AREA HEADQUARTERS, YORK

The duties entail the maintenance of radio, telephone and supervisory equipment and assisting with the maintenance and testing of system protection equipment.

Salary: Schedule A, Class H, Grade 10, £965/£1,090.

Harrogate Sub-Area

SENIOR ASSISTANT ENGINEER
SUB-AREA COMMERCIAL OFFICER'S DEPARTMENT
SUB-AREA HEADQUARTERS, HARROGATE

Applicants should have had experience of commercial practice and distribution in electricity supply, including development work in urban and rural areas.

Salary: Schedule A, Class G, Grade 4, £1,350/£1,500.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol Hse, Newcastle upon Tyne, within ten days of the appearance of this advertisement. (T 106)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS invited for the following Superannuable N.J.B. appointments in the South Wales Division.

ASSISTANT ENGINEERS
(PLANT CONTROL AND EFFICIENCY)
ABERTHAW POWER STATION
THE LEYS, NR. BARRY, GLAM
Vacancy No. 323/ET/60.

Salary: Schedule A, Class L, Grade 10, Scale 10, £1,190/£1,325 per annum, plus 10% shift enhancement.

Applicants should possess H.N.C. or equivalent qualification and have had experience of operation of modern high pressure and temperature unit plant.

FOURTH ASSISTANT ENGINEER
TRANSMISSION DEPARTMENT
(CONSTRUCTION SECTION)
DIVISIONAL HEADQUARTERS, CARDIFF
Vacancy No. 324/ET/60.

Salary: Schedule B, Class AX, Grade 9, Scale 9, £1,005/£1,245 per annum; Grade 10, Scale 8, £935/£1,165 per annum; Grade 11, Scale 7, £855/£1,090 per annum, according to qualifications and experience.

Applicants should possess H.N.C. (Electrical), or equivalent qualification, and have experience in the construction or maintenance of 132 kV substation plant, or overhead lines.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 23 Dec., 1960. (T 114)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 40s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

AIR MINISTRY

require

ASSISTANT MECHANICAL AND ELECTRICAL ENGINEERS

FOR design construction and maintenance of installation on airfields, radar stations, missile bases, workshops and maintenance units for the R.A.F. at home and overseas as well as certain Civil Airports. Salary: £805 at 25 to £1,095 at 34 or over, thereafter rising to max. £1,260 with increase for London and slight decrease for country districts. Appointments long term with promotion and pension prospects. Five-day week with four weeks' two days' leave a year initially. Special allowances payable in addition to salary during overseas service.

Minimum qualifications and experience:

(i) (a) University degree or equiv. diploma in electrical and/or mechanical engineering with at least two years' apprenticeship; or

(b) Graduate or corporate member of I.E.E. with at least three years' apprenticeship; or

(c) Graduate or corporate member of I.Mech.E. appreciable electrical engineering experience with at least three years' apprenticeship; and

(ii) Have been employed for minimum of two years with well established engineering concern and gained wide experience in both electrical and mechanical engineering practice.

Applicants must be natural born British subjects between ages of 25 and 45. Forms from Ministry of Labour, Technical and Scientific Register (K), 26 King St, London S.W.1, quoting D.158/0A. (T 16)

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS are invited for the following posts. Conditions of service in accordance with N.J.M. and H.E. Committee Agreement. Salary includes London Allowance. Qualifications entitling to Corporate Membership of I.E.E. or I.Mech.E. an advantage.

POWER STATION SUPERINTENDENT
LOMBARD RD POWER STATION
Vacancy No. 60/975.

Applicants should have had a wide experience of power station operation, maintenance and administration and should have a lively sense of responsibility in Management/Employee relations.

Salary: N.J.M. and H.E. Scale, Grade 5, Class A, £1,825/£2,025 per annum.

POWER STATION SUPERINTENDENT
WOOLWICH POWER STATION
Vacancy No. 60/976.

Applicants should have had a wide experience of power station operation, maintenance and administration and should have a lively sense of responsibility in Management/Employee relations.

Salary: N.J.M. and H.E. Scale, Grade 5, Class B, £2,025/£2,230 per annum.

Applications, quoting vacancy no. to (or on form from) Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box 136, London W.1, by 20 Dec., 1960. (T 81)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a superannuable appointment as a

THIRD ASSISTANT ENGINEER

in the System Design Section of the Chief Engineer's Department at Board Headquarters.

The successful candidate will be engaged on planning the Board's distribution system for all voltages up to, and including, 33 kV. Candidates should have had previous experience in the construction and operation of distribution systems and some experience in their design would be an advantage. They should possess an engineering degree or qualifications for corporate membership of the Institution of Electrical Engineers.

Salary: N.J.B. Class BX, Grade 8—£1,105/£1,410 per annum.

Applications, quoting reference E46/60, should be submitted to the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow S.4, not later than 23 Dec., 1960. (T 96)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Wolverhampton & District Sub-Area

THIRD ASSISTANT ENGINEER
(CONSTRUCTION, OPERATION AND MAINTENANCE)
(ENGINEERING DEPARTMENT)
(HEADQUARTERS)

Duties will be to assist as necessary in all the work of the Construction, Operation and Maintenance Section. Technical qualifications desirable. Salary: £1,190/£1,325 per annum (N.J.B. Grade L.10).

FOURTH ASSISTANT ENGINEERS (TWO)
(ENGINEERING DEPARTMENT)
(HEADQUARTERS)

Duties will be of a general nature within the Technical and Planning Section. Salary according to experience and qualifications, £965/£1,090 per annum (N.J.B. Grade L.13) or £1,040/£1,165 per annum (N.J.B. Grade L.12).

THIRD ASSISTANT DISTRICT
COMMERCIAL ENGINEER (CANNOCK)

Applicants should have wide experience in repairs to consumers' wiring and apparatus and will be required to control Service Workshops, including Radio and Television Service Section. Technical qualifications desirable. Salary: £825/£940 per annum (N.J.B. Grade F.10).

Apply, by letter, within ten days, stating age, experience, qualifications, present position and salary to Mr D. Holt, Sub-Area Manager, Midlands Electricity Board, 83 Darlington St, Wolverhampton.

F. W. CATER,
Secretary.
(T 87)

COUNTY BOROUGH OF OLDHAM

Lighting Department

APPOINTMENT OF TECHNICAL ASSISTANT (ELECTRICAL)

APPLICATIONS are invited for the above appointment at a salary within the Grade A.P.T.1 (£645/£815 per annum).

Applicants should have experience in the estimation, design and preparation of schemes for electrical heating, lighting and power installations and should be capable of handling skilled labour engaged on electrical contracting work within the Corporation.

An Ordinary National Certificate in Electrical Engineering or the equivalent should be held.

The post is superannuable and a five-day week is in operation.

Applications, giving full particulars as to age, education and experience together with the names of two referees, should reach The Superintendent, Corporation Lighting Department, Gas St, Oldham, not later than 12 Dec., 1960. (T 92)

CORPORATION OF GLASGOW

Architectural and Planning Department

APPLICATIONS are invited for vacancies for

CLERKS OF WORKS (ELECTRICAL)

Grade III, wage £12 15s 8d, rising to £14 0s 8d per week.

Successful candidates will be engaged on periodic surveys and tests of electrical installations in existing and new buildings and will be required to write reports.

Possession of City and Guilds Certificate Electrical Installation Work will be an advantage.

These appointments are superannuable and subject to medical examination.

Application form obtainable from the Principal Administrative Officer, 20 Trongate, Glasgow C.1. (T 89)

THE NUCLEAR POWER GROUP

requires

ELECTRICAL AND MECHANICAL ENGINEERS

THE Group, now actively engaged on the construction of four major nuclear power stations as well as designs for new plants in the United Kingdom and overseas, invites applications from engineers suitably qualified for the following positions:

Station Auxiliary Electrical Systems

ONE SENIOR AND ONE JUNIOR ELECTRICAL ENGINEER

for the design of the auxiliary power systems for conventional and reactor plant. Candidates should have several years' experience in power station auxiliary electrical systems up to 11 kV and for the senior position should have a Degree in Electrical Engineering.

Reactor Control Systems

ONE ELECTRICAL ENGINEER

to design reactor control equipment where very high standards of reliability are essential. Candidates should have a Degree in Electrical Engineering and several years' experience on medium size rotating and static electrical plant. Experience in the design of industrial servo and precision motor control systems would be an advantage.

Reactor Core Design

ONE MECHANICAL ENGINEER

for heat transfer, stress and energy storage calculations associated with graphite in reactor cores. Candidates should have 2-3 years' industrial experience and an Engineering Degree.

Burst Fuel Cartridge Detection

ONE ELECTRICAL OR MECHANICAL ENGINEER

for the design of monitoring equipment for the detection of Burst Fuel Cartridges. Candidates should have an Engineering Degree or equivalent qualification and at least 3 years' experience in medium or light precision engineering.

Reactor Instrumentation

ONE INSTRUMENT ENGINEER

for the design of instrumentation schemes for nuclear power stations, including comprehensive temperature and neutron flux measuring schemes. Candidates should have several years' industrial instrumentation experience.

The Company operates a Contributory Pension Scheme and assistance with house purchase is given to married men.

Applications, giving full details of age, qualifications and experience, should be addressed to: The Personnel Manager, The Nuclear Power Group, Radbroke Hall, Knutsford, Cheshire. Quoting reference: ET/ELEC/16. (T 95)

LONDON ELECTRICITY BOARD

DISTRICT COMMERCIAL ENGINEER

APPLICATIONS are invited for the above position in the Board's South Eastern District at 44 Powis St, Woolwich, S.E.18.

The successful candidate will be responsible to the District Manager for the supervision and control of the District Commercial organisation. Applicants must have experience in the development of electricity supply, control of showrooms, sales staff, administration and operation of hire and hire-purchase schemes, electrical contracting, change-over work and consumers' service. Appropriate technical qualifications would be an advantage.

The post is graded within classification D Grade 2, of the National Joint Managerial and Higher Executive Grades Agreement; salary range: £1,825/£2,025 per annum, inclusive of London Allowance.

Application form obtainable from the Secretary, 46 New Broad St, London E.C.2, to be returned completed within ten days of the publication date of this notice. Please quote ref.: PER/V/3149/T. (T 77)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

GENERAL ASSISTANT ENGINEER
WARWICK POWER STATION
Vacancy No. 268/60.

APPLICATIONS are invited for the position of General Assistant Engineer at Warwick Power Station, Emscote Rd, Warwick.

The successful applicant will be given the opportunity to obtain operating and maintenance experience. Applicants should be in possession of suitable engineering qualifications.

The salary during the initial training period will depend upon qualifications and knowledge, and will be within the range £625/£805 per annum of the National Joint Board Agreement.

Closing date for receipt of applications: 23 Dec., 1960.

ASSISTANT SHIFT CHARGE ENGINEER
DRAKELOW "A" POWER STATION
Vacancy No. 269/60.

Applications are invited for the position of Assistant Shift Charge Engineer at Drakelow "A" Power Station, near Burton-on-Trent.

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class J, Grade 8 (£1,190/£1,325 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 23 Dec., 1960.

ASSISTANT SHIFT CHARGE ENGINEER
NORTHAMPTON POWER STATION
Vacancy No. 265/60.

Applications are invited for the position of Assistant Shift Charge Engineer at Northampton Power Station, Nunn Mills Rd, Northampton.

Candidates should have sound technical training and practical power station experience in the operation of steam raising and generating plant, main and auxiliary switchgear.

Salary will be in accordance with Class G, Grade 9 (£965/£1,090 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 12 Dec., 1960.

GENERAL ASSISTANT ENGINEER
HIGH MARNHAM POWER STATION
Vacancy No. 266/60.

Applications are invited for the position of General Assistant Engineer at High Marnham Power Station, near Newark, Notts.

Applicants should hold the Ordinary National Certificate in Mechanical or Electrical Engineering. There are good opportunities for keen engineers who are willing to study new plant and methods.

The salary during the initial training period will depend on qualifications and knowledge and will be within the range £625/£805 per annum of the National Joint Board Agreement.

Closing date for receipt of applications: 16 Dec., 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Station Superintendent concerned and should be returned to him by the date stated.

ASSISTANT CHEMIST
DIVISIONAL LABORATORY
Vacancy No. 267/60.

Applications are invited for the position of Assistant Chemist in the Divisional Laboratory at North Wilford Power Station, Queens Dr, Nottingham.

Candidates should be capable of initiating and leading investigations into such topics as air pollution, river pollution, industrial water treatment, analytical method develop-

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ment, and should have a sound knowledge or inorganic analysis.

Candidates should hold a degree or equivalent professional qualification. Previous power station experience is advantageous although not essential.

Salary will be in accordance with Class BX, Grade 8 (£1,105/£1,410 per annum) of the National Joint Board Agreement, and the position will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned not later than 31 Dec., 1960

O. S. WOODS,
Divisional Controller.
(T 93)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Division

APPLICATIONS are invited for the post of

STATISTICAL ASSISTANT

in the Divisional Laboratory situated at Nechells "A" Power Station. The duties associated with this post will include the design and analysis of experimental trials and the preparation and maintenance of quality control charts. Preference will be given to candidates having a knowledge of chemistry particularly relating to fuels.

Candidates should possess a Statistical Diploma or hold a suitable degree in Mathematics.

The salary will be in accordance with the N.J.B. Agreement, Schedule B, Class BX, either Grade 7, £1,200/£1,500 per annum, or Grade 6, £1,285/£1,610 per annum, according to qualifications and experience.

Apply, quoting Vacancy Number 333/60MD to the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 19 Dec., 1960. (T 80)

KENYA GOVERNMENT

TECHNICAL INSTRUCTOR (ELECTRICAL)

REQUIRED by Education Department. Appointment at candidate's option either on probation to permanent and pensionable establishment or on contract for one tour with gratuity at rate 13½% of total salary drawn. Normal tour 36/45 months. Commencing salary according to age and experience up to maximum, in scale (including Inducement Addition) rising to £1,341 a year. Outfit allowance £40. Free passages. Liberal leave.

Candidates, under 45 years of age, must possess C. and G. Final Certificate or O.N.C. in Electrical Engineering and have had practical experience. Duties will be teaching the practical work to students taking C. and G. and O.N.C. courses in the Kenya Polytechnic, Nairobi. Apply to Crown Agents, 4 Millbank, London S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience and quoting reference M2A/51021/EE. (T 83)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Fife Area

SECOND ASSISTANT DISTRICT ENGINEER
FIFE EASTERN DISTRICT

APPLICATIONS are invited from Engineers with a sound training and subsequent experience in H.V. and L.V. Distribution Systems.

Candidates should possess the Higher National Certificate in Electrical Engineering or equivalent qualification.

N.J.B. Conditions and Salary. N.J.B. Class F, Grade 7, Scale 8, £1,040/£1,165 per annum; post superannuable, subject to satisfactory evidence of health. The successful candidate will require to reside within a reasonable distance of the District Office at Cupar.

Applications, on standard form obtainable from the Area Manager, S.S.E.B., East Port, Dunfermline, should be returned to him not later than Friday, 16 Dec., 1960. (T 76)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

KINGSTON POWER STATION
ELECTRICAL MAINTENANCE ENGINEER
Vacancy No. 215a/60T

THE successful candidate will be responsible for the organisation and efficient working of the Electrical Maintenance Department in a high merit station. Applicants should have had experience in the maintenance of heavy electrical plant and switchgear and should possess the H.N.C. in Electrical Engineering (Power). Experience in the control of labour is desirable.

The Station is pleasantly situated on the banks of the River Thames near a good shopping centre. Good educational facilities are available in the area.

Salary: N.J.B. Class G, Grade 6, £1,240/£1,375 per annum including London Allowance.

Applications, giving age, details of experience, qualifications, etc., and quoting Vacancy No. should be sent to the Station Superintendent, Kingston Power Station, Down Hall Rd, Kingston upon Thames, Surrey, to arrive by 20 Dec., 1960.

W. H. DUNKLEY,
Divisional Controller.
(T 98)

THE NUCLEAR POWER GROUP

requires

PROJECTS AND PLANNING ENGINEERS

THE Group, now engaged on the construction of four major nuclear power stations in the United Kingdom and overseas, invites applications from suitably experienced men for positions in its

PROJECTS DEPARTMENT

PROJECTS ENGINEERS

Vacancies exist for Mechanical, Electrical and Civil Engineers, to assist in the preparation of large contracts for plant and equipment. The duties comprise co-ordination of tenders, preparations of inquiries and orders for major plant and subsequent instructions to contractors during manufacture and construction. Previous experience of large engineering contracts, preferably in the power industry, is necessary. Candidates should be members of an engineering institution or possess exempting qualifications.

PLANNING ENGINEERS

The work involves preparation of overall programmes, from tender to final completion of power station projects. Site construction experience and also some experience in planning, involving co-ordination of major engineering contracts, is desirable, and candidates should be members of an engineering institution or possess exempting qualifications.

The Company operates a Contributory Pension Scheme, and assistance with house purchase is given to married men.

Applications, giving full details of age, qualifications and experience, should be addressed to: The Personnel Manager, The Nuclear Power Group, Radbroke Hall, Knutsford, Cheshire. Quoting reference: ET/PROJ/15. (T 94)

THE NORTH WESTERN ELECTRICITY BOARD

FOURTH ASSISTANT ENGINEER
CLAYTON TESTING STATION
SUB-AREA ENGINEERING DEPARTMENT

APPLICANTS should have experience in the testing of all types of protective equipment including associated control and other gear. Preference will be given to applicants who hold the H.N.C. in Electrical Engineering.

Salary Scale: £965 x 25—£1,090 p.a. Grade L.13. N.J.B. conditions.

Applications on forms to be obtained from the Manager, No. 5 Sub-Area, The North Western Electricity Board, Jubilee St, Blackburn, and returned to him by 21 Dec., 1960. (T 90)

SOUTH WESTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following position:

DEMONSTRATOR
KINGSBRIDGE/TOTNES BRANCHES
TORBAY DISTRICT

Salary within Grade 1—£600/£700 per annum—of the N.J.C. Agreement.

Duties will include the demonstration of cooking and other electrical apparatus in Service Centres and consumers' premises in the interest of sales development, and advising on the selection and use of such apparatus. The successful candidate may also be required to undertake duties with exhibitions, shows, etc., including evening demonstrations in Women's Institutes and similar organisations.

Candidates should be of good education and address and hold a recognised Domestic Science qualification with preferably the E.A.W. Electrical Housecraft Certificate. The possession of a current driving licence would be an advantage.

Applications to be made on standard Form AE6/ACT OBTAINABLE BY POST-CARD ONLY from the District Manager, South Western Electricity Board, Electric Hse, Union Street, Torquay. Closing date for receipt of completed applications is 23 December, 1960. (T 104)

SOUTHERN ELECTRICITY BOARD

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)

HESTON District of No 1 (Southall) Sub-Area. Salary: N.J.B. Class G, Grade 9 (£1,015/£1,140 per annum, inclusive of London Allowance). N.J.B. Conditions of Service.

The duties of the post will be to assist with the maintenance and operation of switchgear, transformers, auxiliary gear and and underground cables up to and including 11 kV. The appointment will involve stand-by duties. Rented housing accommodation may be made available.

Applications on forms obtainable from the Sub-Area Secretary, 2-6 Windmill La, Southall, Middlesex, and returned to him, quoting Z.1197, not later than 19 Dec., 1960.

ASSISTANT ENGINEER
(INSTALLATIONS)

Bournemouth District of No. 4 (Bournemouth) Sub-Area). Salary: N.J.B. Class J, Grade 11 (£965/£1,090 per annum). N.J.B. Conditions of Service.

The successful candidate will be required to assist the Grade 9 Assistant Engineer (Installations) in the control and organisation of the work of the Installations Section of the District Engineering Department.

Applicants should have had sound experience in electricity supply distribution. Previous experience in metering work and in testing and inspecting consumers' installations, and the possession of suitable technical qualifications will be advantages.

Applications on forms obtainable from the Sub-Area Secretary, 1 Priory Rd, Bournemouth, and returned to him, quoting Z.1289, not later than 19 Dec., 1960.

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)

Portsmouth District of No. 3 (Portsmouth) Sub-Area. Salary: N.J.B. Class J, Grade 11 (£965/£1,090 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton La, Cosham, Portsmouth, and returned to him, quoting Z.1286, not later than 19 Dec, 1960.

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)

Melksham District of No. 2 (Newbury) Sub-Area. Salary: N.J.B. Class G, Grade 9 (£965/£1,090 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist with the maintenance and operation of

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H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting Z.1291, not later than 19 Dec., 1960.

ASSISTANT ENGINEER
(LOCAL)

Newbury District of No 2 (Newbury) Sub-Area, located at Andover. Salary: N.J.B. Class F, Grade 10 (£825/£940 per annum). N.J.B. Conditions of Service.

Applicants should have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution equipment, and possess suitable technical qualifications.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting Z.1256, not later than 19 Dec., 1960.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. (T 107)

THE SOUTH WALES ELECTRICITY BOARD

FIRST ASSISTANT ENGINEER/
GENERAL ASSISTANT ENGINEER

APPLICATIONS are invited for the following superannuable posts:

(a) FIRST ASSISTANT ENGINEER
(RHONDDA DISTRICT)

Salary: N.J.B. Class F, Grade 4, Scale 11 (£1,275/£1,410 per annum).

The successful applicant should have experience in overhead and underground line construction. Preference will be given to Engineers possessing the Higher National Certificate in Electrical Engineering.

Applications stating age, present position, present salary, qualifications and experience, should be addressed to C. L. Townsend, ASSOCIATE I.E.E., Manager, Cardiff and East Central Area, 445-447 Cowbridge Rd East, Cardiff, to arrive not later than 28 Dec., 1960. Please quote reference 217/60/ET, endorsing envelope "First Assistant Engineer."

(b) GENERAL ASSISTANT ENGINEER
(NEWPORT DISTRICT)

Salary: N.J.B. Class G, Grade 11, Scale 5 (£825/£940 per annum).

Preference will be given to Engineers possessing the Higher National Certificate in Electrical Engineering.

Applications stating age, present position, present salary, qualifications and experience, should be addressed to D. G. Gwyn, B.SC., A.M.I.E.E., Manager, Monmouthshire and Mid-Wales Area, Llywelyn Rd, Cwmbran, Mon, to arrive not later than 28 Dec., 1960. Please quote reference 216/60/ET, endorsing envelope "General Assistant Engineer."

R. G. WILLIAMS,
Secretary.
(T 103)

AIR MINISTRY

Works Designs Branch

REQUIRES in London and Provinces
ENGINEERING DESIGNER
DRAUGHTSMEN

experienced in preparation of schemes for illumination and electrical equipment of buildings or schemes for H.V. and M.V. electrical distribution. Candidates should have served recognised apprenticeship or had equiv. training and also have had practical

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exp. O.N.C. an advantage. Financial assistance and time off for recognised courses of study. Promotion and pension prospects. Five-day week with 18 days' paid leave per year initially. Overseas tours for which special allowances granted.

Salary: in London ranges from £805 (age 25) to £980 p.a., somewhat lower in Provinces. Commencing salary dependent on age, quals. and exp. Applicants, who must be natural born British subjects, should write quoting O/N King's Cross 4354 to Air Ministry, W.G.d, Theobalds Rd, London W.C.1, or to any Employment Exchange, giving age, details of training, quals., full particulars of former posts held and copies of any testimonials. Candidates selected will normally be interviewed in London and certain expenses reimbursed. (T 82)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a Superannuation Scheme and may be required to undergo a medical examination.

Chilterns Sub-Area

HEMEL HEMPSTEAD DISTRICT
TWO FOURTH ASSISTANT ENGINEERS
319/60.R.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, including substations.

Salary: N.J.B. Class F, Grade 11 (£765/£870).

Apply by letter to the Manager, Hemel Hempstead District, Eastern Electricity Board, Bridge St, Hemel Hempstead, Herts, by 23 Dec., 1960.

LUTON DISTRICT
SENIOR DEMONSTRATOR
320/60.R.

Candidates should hold the E.A.W. Diploma. Experience in the organisation of public demonstrations and lecturing on domestic electrical subjects, together with proved sales ability, preferably with direct experience in the sale of all types of domestic apparatus, is essential.

Salary: N.J.C. Grade 2 (£700/£775).

Apply by letter to the Manager, Luton District, Eastern Electricity Board, 487 Dunstable Rd, Luton, by 23 Dec., 1960.

Northmet Sub-Area

EDMONTON DISTRICT

(a) SECOND ASSISTANT ENGINEER (Ref. 1021)
321/60.R.

(b) THIRD ASSISTANT ENGINEER (Ref. 988)
322/60.R.

For post (a) candidates should have had a sound technical training and considerable experience in the construction, operation and maintenance of underground distribution systems at voltages up to and including 33 kV.

For post (b) candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations. Suitable accommodation is available comprising a two-bedroomed self-contained flat for post (b).

Salary: N.J.B. Class F (a), Grade 7 (£1,040/£1,165); (b) Grade 9 (£890/£1,015), plus London Allowance.

For these posts apply by letter to C. A. Baker, B.SC.(ENG.), LOND.M.I.E.E., Manager, Eastern Electricity Board, 305 Fore St, Edmonton, N.9, by 19 Dec., 1960. (T 115)

CAMBORNE SCHOOL OF METALLIFEROUS MINING, CAMBORNE, CORNWALL

ASSISTANT LECTURER, GRADE B
To Teach Electrical Engineering and Associated Subjects

QUALIFICATIONS: Degree in Engineering of Physics, or professional qualification in Electrical Engineering, with mining, industrial or teaching experience for which increments will be allowed. Salary: £700/£1,150 x £27 10s = qualification allowance on Burnham Scale. Facilities for research. Apply to the Secretary, who will be pleased to supply further information; state when available. (T 100)

SOUTH OF SCOTLAND ELECTRICITY BOARD

PRINCIPAL ASSISTANT

REQUIRED for Publicity Section of Chief Commercial Officer's Department, Board Headquarters. Applicants should possess extensive experience in all aspects of Publicity. Duties will include Press, poster, TV and cinema advertising, publications and sales literature. Ability to write good copy is essential and experience of industrial journalism would be an advantage. Candidates should preferably have held a responsible publicity position.

Salary: £1,250/£1,355. Superannuable.

Apply, quoting reference number C9/60, giving full particulars of past experience, age, etc., to the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow S.4, not later than Friday, 23 Dec., 1960. (T 78)

BRADFORD INSTITUTE OF TECHNOLOGY

Department of Electrical Engineering

APPLICATIONS are invited for the following posts in this rapidly expanding department which offers exceptional opportunities for teaching, consulting and research work:

SENIOR LECTURER IN ELECTRICAL ENGINEERING
Salary scale £1,550 to £1,750.

LECTURER IN ELECTRICAL ENGINEERING
Salary scale £1,370 to £1,550.

Candidates should be suitably qualified to teach to final degree standard in electrical power and machines *or* electronics and telecommunications. Industrial and research experience will be a recommendation.

The successful candidates will be encouraged to develop industrial contacts and undertake research for which adequate facilities will be available.

Previous industrial and research experience at a suitable level will be taken into account in fixing the commencing salary.

Further particulars and forms of application may be obtained from the Registrar, Bradford Institute of Technology, Bradford 7.

HENRY PATTEN,
Clerk to the Governors.
(T 97)

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER
EASTBOURNE DISTRICT

SALARY: £1,040/£1,165 under N.J.B. Class F, Grade 7. Preference given to applicants with technical qualifications up to H.N.C. standard and with practical experience of the planning, construction, operation and maintenance of M.V. and 11 kV underground and overhead systems. The successful applicant will be required to undertake standby duties.

Applications quoting ET and naming two referees on forms from District Manager, Seeboard, Electric Hse, Grove Rd, Eastbourne, by 21 Dec., 1960.

FITTER (ELECTRICAL)
EAST SUSSEX AND SOUTH WEST KENT

Wages 5s 6½d per hour for 44-hour five-day week under N.J.I.C. Agreement. The successful applicant will be based on the workshop at Eastbourne, but the duties will chiefly comprise erection and maintenance of switchgear and transformers in major substations in all parts of the sub-area.

Applications, quoting ET and naming two referees, to East Sussex and S.W. Kent Manager, Seeboard, "Westlords," Willingdon Rd, Eastbourne, by 21 Dec., 1960.

DISTRICT CHIEF CLERK
HASTINGS DISTRICT

Salary £1,250 x £35—£1,355 per annum under N.J.C. Agreement Grade 7. Applications are invited for the above position which will become vacant in a few months time on the retirement of the present holder. Applicants must have had a wide practical knowledge of all aspects of the clerical departments of a district. They should be experienced in the control of staff and be capable organisers. Possession of a professional qualification desirable. The successful applicant may have the opportunity of working alongside his pre-

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decessor for a time before the latter's retirement.

Applications, quoting ET and naming two referees to District Manager, Seeboard, 12/13 York Bldgs, Hastings, by 21 Dec., 1960.

GEORGE WRAY,
Secretary.
(T 101)

BP has a vacancy for an ELECTRICAL DRAUGHTSMAN at its Head Office in London. Applicants aged 25-35 should have completed an apprenticeship in Electrical Engineering and be in possession of at least O.N.C. (Electrical) or equivalent and have had experience on electrical installations for process plants, workshops and factories. This work will involve visits to Company installations in the U.K. and overseas. Salary according to age and experience. Non-contributory Pension Scheme. Removal and settling-in allowances payable in certain cases. Luncheon club. Write, quoting reference H.5244B, to Box 6460, c/o Hanway Hse, Clark's Pl, E.C.2. (T 79)

GPO

A FIRST-CLASS JOB IN THE G.P.O.

Men between the ages of 20—35 are required to work in Central London on installing and maintaining telephone apparatus and transmission equipment. Older men, up to the age of 45, will be accepted if they have the experience which is particularly suitable.

Commencing pay is £9 16s per week rising to £12 2s.

Men who show ability to progress will be given every opportunity to qualify for Technical Officer posts on which the salary is £600 a year rising to £850. Further promotion is available.

Apply in writing stating age and experience to:

Chief Regional Engineer
(Ref. S/D2A(X2)),
London Telecommunications Region,
Waterloo Bridge House,
Waterloo Road,
London, S.E.1. (T 14)

LARGE ELECTRICAL CONTRACTORS

require

CONTRACTS MANAGER

The successful applicant will be responsible for all aspects of Contract Organisation and Execution and should have drive, initiative and a thorough training in Electrical Contracting.

A salary of between £1,500 and £1,700 is envisaged and a car or car allowance will be provided. This is a superannuated position in a Company having a large expansion programme before them.

Applications, which will be treated in the strictest confidence, should be in writing, stating age, experience, qualifications and present salary, to: Box No. 8101, Electrical Times.

(T 113)

BRITISH Engine Boiler and Electrical Insurance Co. Ltd., 98 West George St, Glasgow C.2. ELECTRICAL SURVEYOR required in Scotland. Permanent position carrying progressive salary scale £800/£1,100 and non-contributory pension. Candidates, aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E. and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. (T 109)

DEVELOPMENT ENGINEER AND ASSISTANT, engineer to take charge of a Heater Development Laboratory, after a short initial period. Able to see design through from inception to quantity production with minimum supervision. O.N.C. (Electrical) minimum, but a higher qualification is desirable, together with some years' practical experience of small appliances, and a sound knowledge of elementary physics. Assistant O.N.C. standard. Send details and qualifications, experience, positions held, present salary, etc., to the PERSONNEL MANAGER, E. K. COLE LTD., MALMESBURY, WILTSHIRE. (T 118)

NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE

1. MAINTENANCE SECTION ENGINEER (Ref. VN1649) wanted for commissioning, maintenance and fault-finding of electrical and electronic components of the new High Energy Particle Accelerator—NIMROD—now under construction at the Rutherford High Energy Laboratory. Experience of control equipment and stabilised power supplies essential; knowledge of high power R.F. equipment and monitoring units an advantage.

2. SERVICES SECTION ENGINEER (Ref. VN2249) for installation and maintenance of the site H.V. and M.V. distribution network substation and all building electrical services; construction, installation and commissioning of experimental equipment associated with NIMROD. Experience required in installation, commissioning or maintenance of large factory distribution systems, physics laboratory experimental equipment or heavy electrical plant.

Qualifications: Corporate Membership of I.E.E. or exempting qualifications. Recognised engineering apprenticeship or equivalent. Salary according to age and experience in range: Post 1 £860/£1,340; Post 2 £860/£1,825. Posts permanent and superannuable. Post card for application forms and further details from Recruitment Officer, National Institute for Research in Nuclear Science, Harwell, Berks, quoting ref. number as above. (T 91)

FULLER ELECTRIC LIMITED

(A MEMBER OF THE HAWKER SIDDELEY GROUP)

have the following vacancies

CURRENT TRANSFORMER DESIGNER

Applicants should be suitably qualified and must have been previously engaged upon this type of work. Should the successful applicant so desire, he will be given an opportunity to gain experience in power transformer design.

OUTSIDE TECHNICAL SALES ENGINEER

for variable speed commutator motors and other industrial electrical equipment. Engineers with experience of standard industrial drives and/or merchant marine will be given preference. Car provided.

JUNIOR TECHNICAL SALES ENGINEER

For Transformer Sales Department. Applicants should have knowledge of High Voltage Power Equipment and some commercial experience.

PRINTING AND ALLIED INDUSTRIES DRAWING OFFICES

Electrical Draughtsmen for detailing and layout of wiring and cable diagrams for electrical driving equipment.

CONTROL GEAR DRAWING OFFICE

Control Gear Draughtsmen for industrial and power station cubicle work.

TEST ASSISTANT

for on-load tap changer test department. Staff position. Young men aged 23-30 with suitable background and experience will be considered for training.

Salaries will be commensurate with age, qualifications and experience.

Should you be interested in any of these vacancies, on receipt of a post card we will send you an application form for completion.

Apply in the first instance to the Personnel Manager,

FULLER ELECTRIC LIMITED, Fulbourne Road, London, E.17.

(T 86)

BRUSH

(A member of the Hawker Siddeley Group—Industrial Division)

DESIGN ENGINEERS
DESIGNER DRAUGHTSMEN
DRAUGHTSMEN

This Company, which is situated on the outskirts of a small town amid the pleasant Leicestershire countryside, requires fully experienced men in the above categories to work on:—

RAIL TRACTION CONTROL GEAR

A.C., D.C. AND TRACTION ROTATING ELECTRICAL MACHINES

SWITCHGEAR

MOTOR CONTROL GEAR

GENERAL ENGINEERING

RESEARCH EQUIPMENT

Attractive salaries, stable employment, assistance with housing and removal expenses in appropriate cases are only some of the advantages of coming to work for BRUSH.

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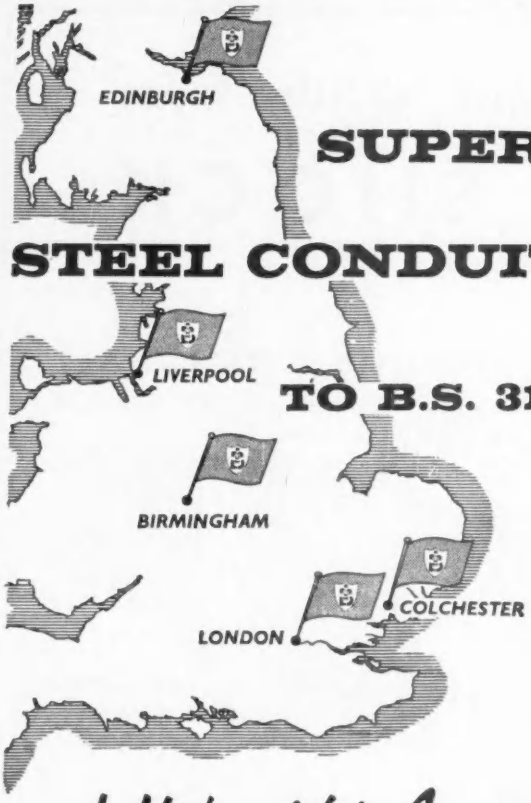

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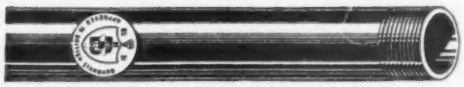

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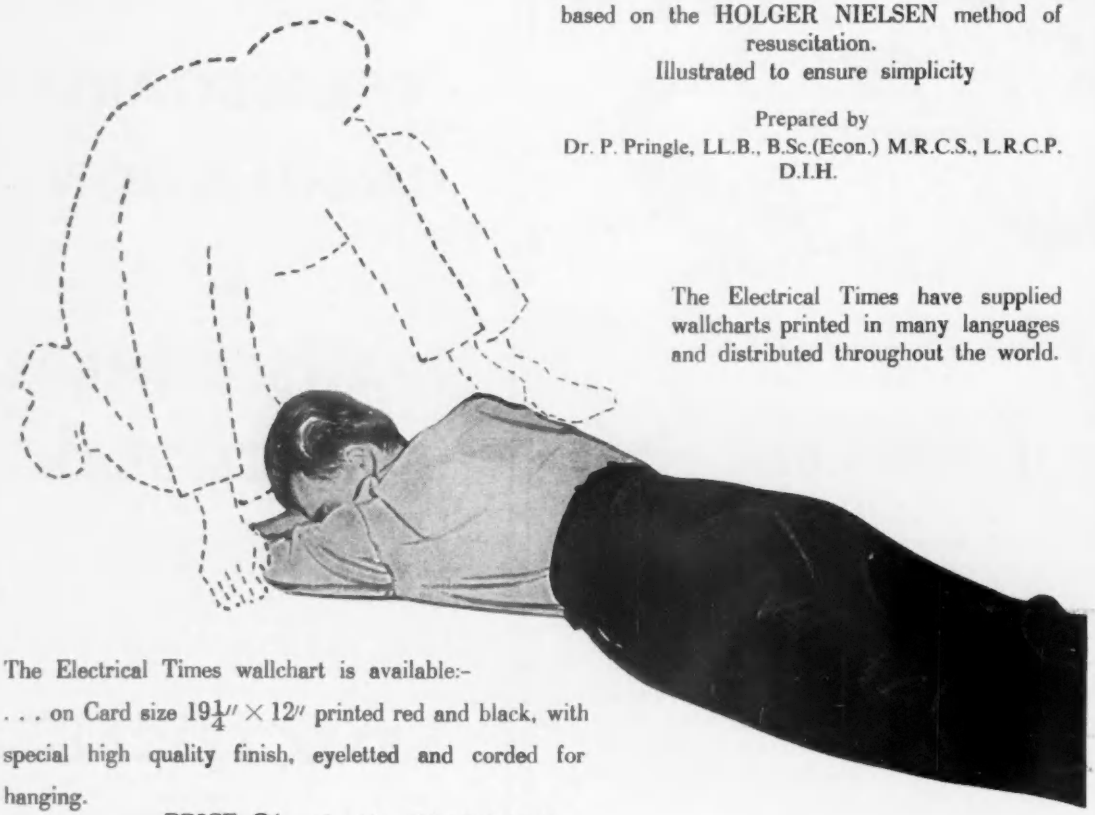

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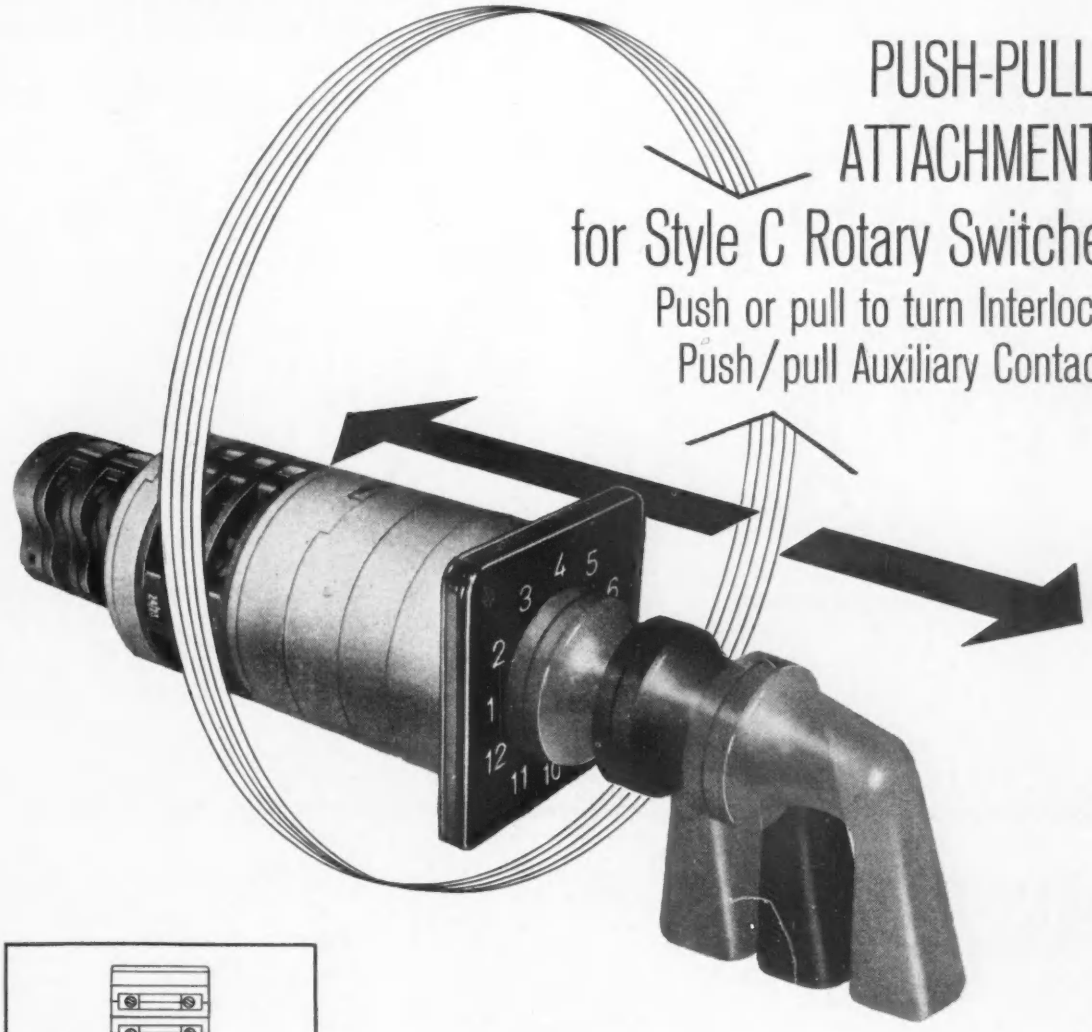

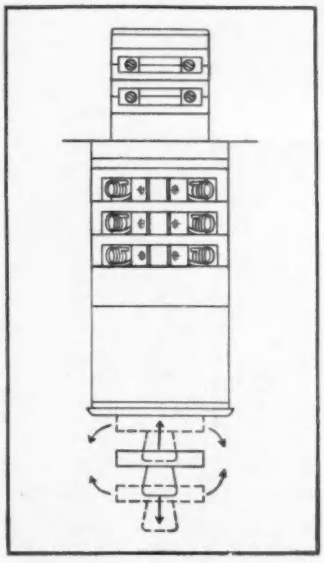

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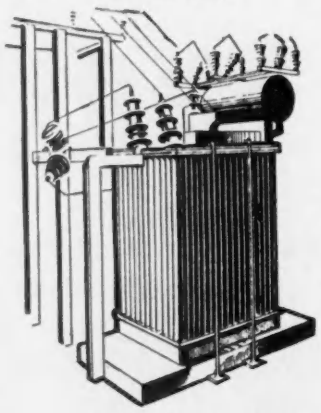

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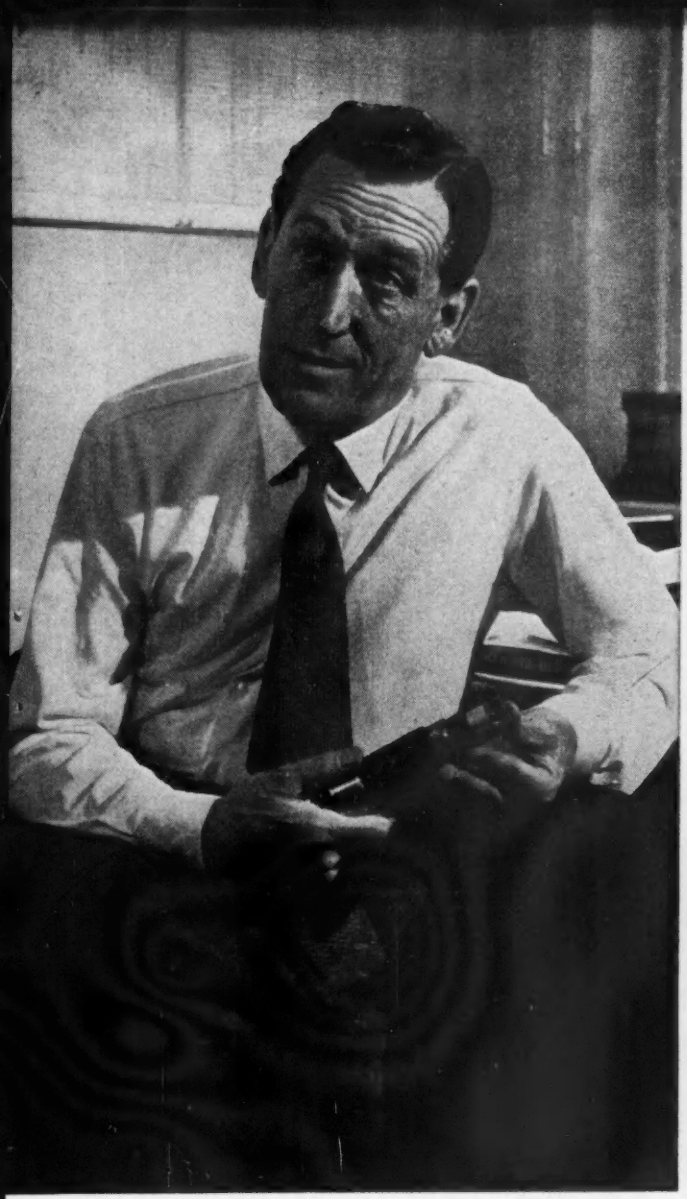

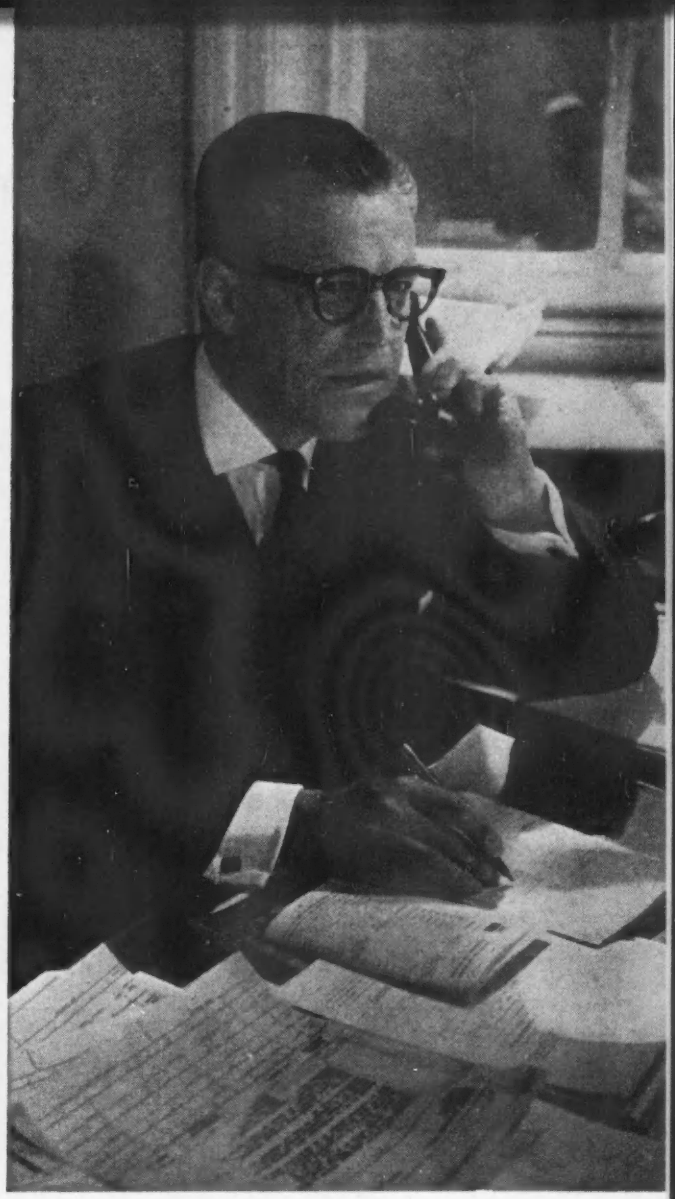

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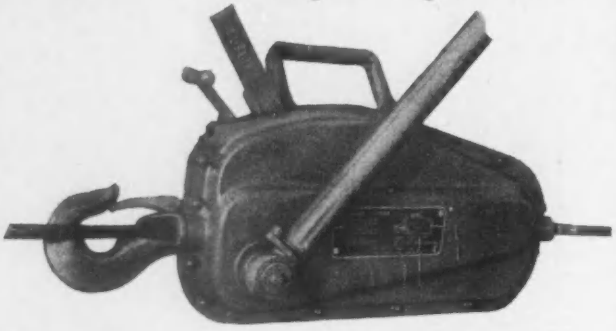

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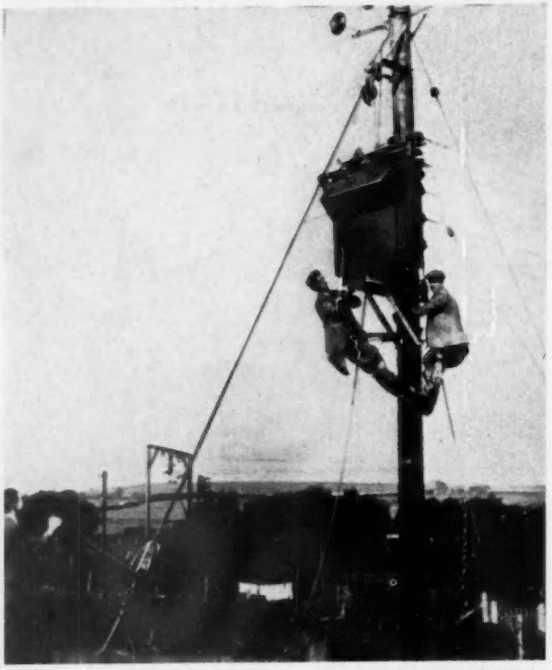

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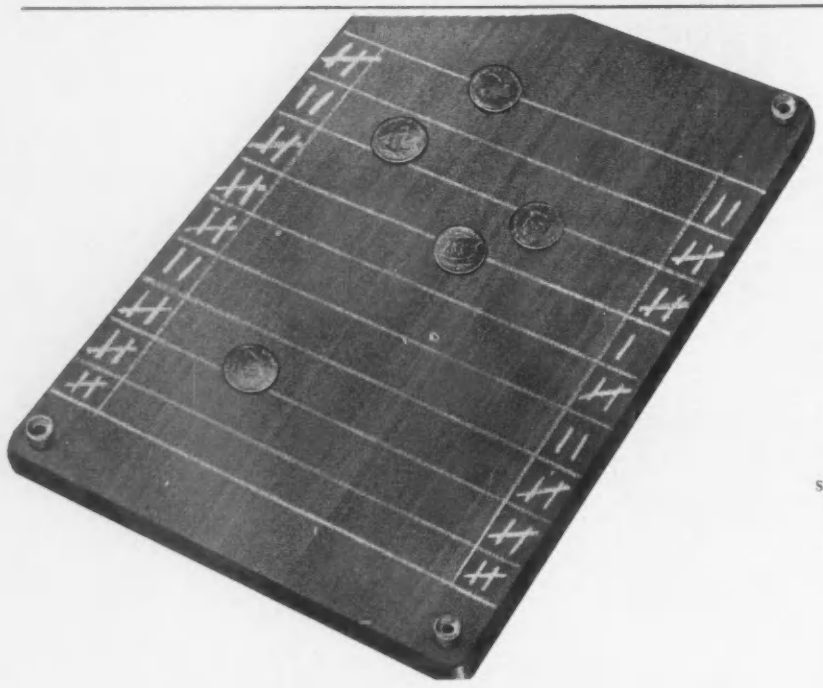

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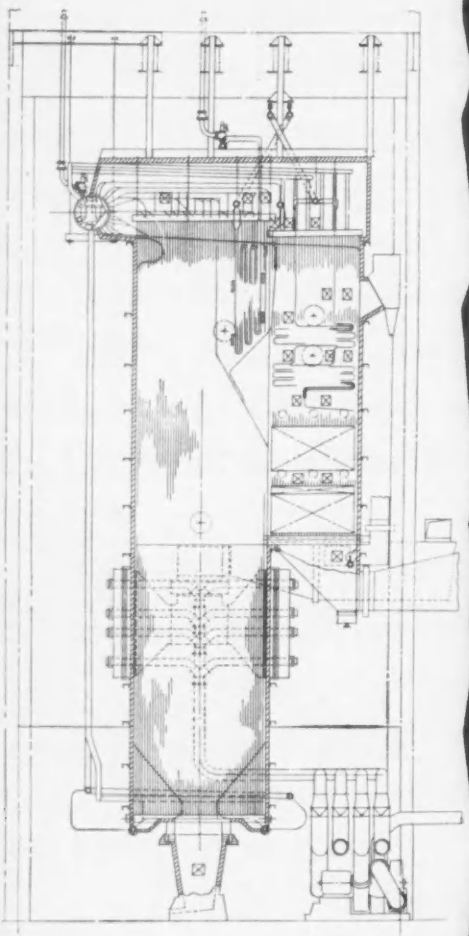

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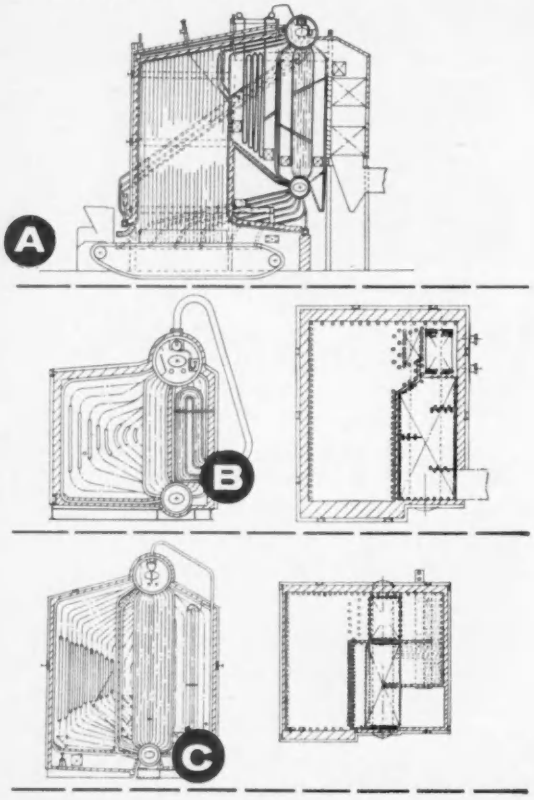
Yarrow and Company are fully equipped to supply all sizes of modern stoker, oil or gas fired Bi-Drum Boilers. Recent advances in engineering practice leading to pre-engineering of style and standardisation of components ensure early delivery at competitive prices. Every Boiler Contract is backed by comprehensive engineering and research facilities with efficient after sales service.



A One of a comprehensive range of stoker fired boilers

B Shop Assembled package units for oil or gas firing

C A range of these standard engineered units is available for oil or gas firing

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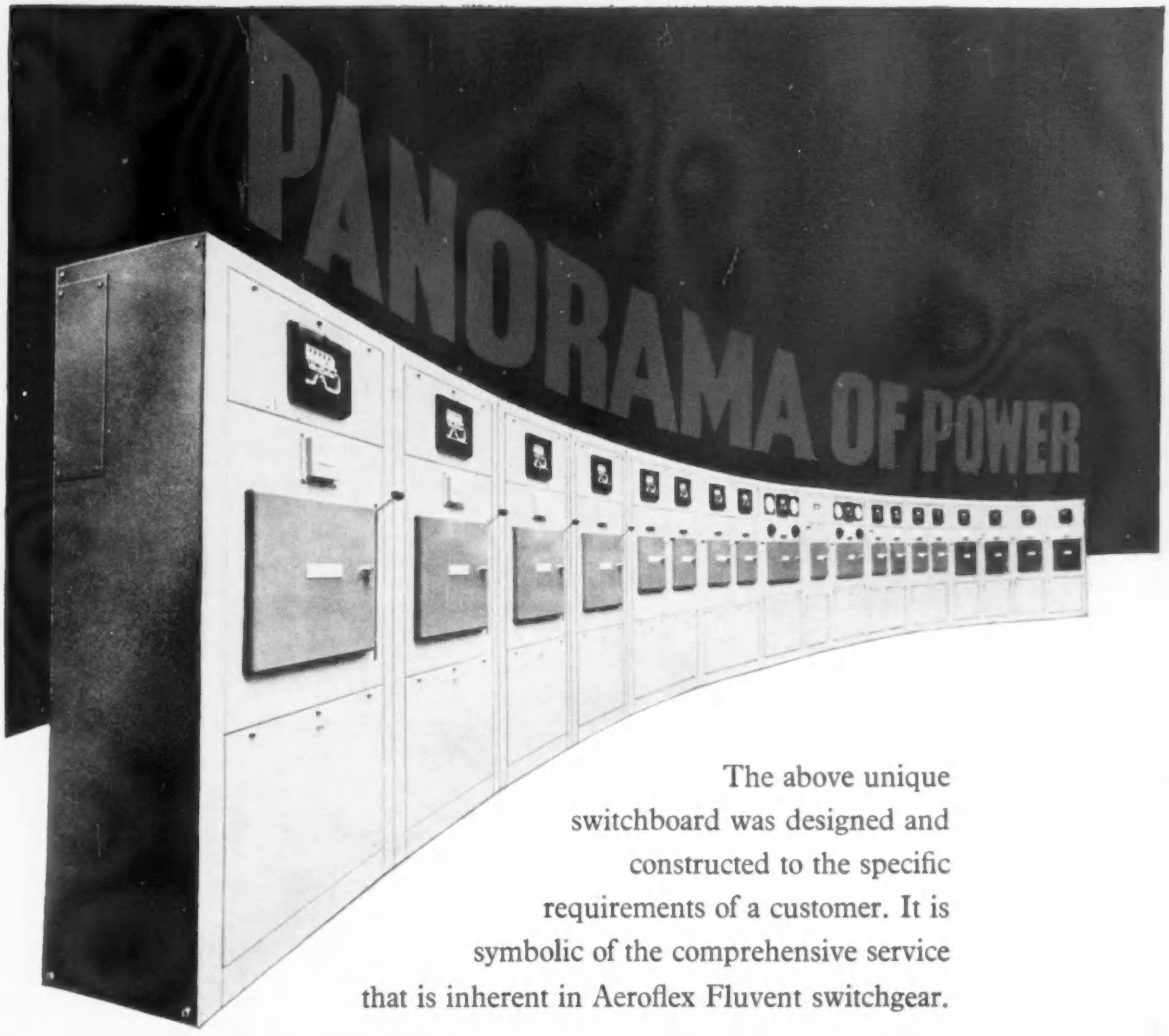
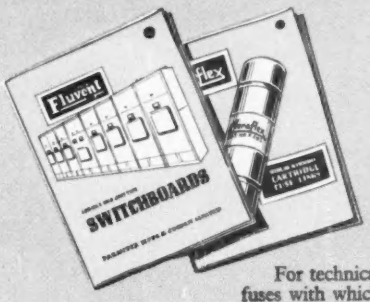


The above unique switchboard was designed and constructed to the specific requirements of a customer. It is symbolic of the comprehensive service that is inherent in Aeroflex Fluvent switchgear.



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For technical details of these switchboards and the Aeroflex fuses with which they are equipped, please send for Lists SB2 and CF2.

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